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ACUTE DIFFUSE GONOCOCCUS PERITONITIS.

By Harvey W. Cushing, M. D.

(*From the Surgical Clinic of Dr. Halsted, The Johns Hopkins Hospital.*)

Owing to the influence of Bumm's original assertion, that gonorrhœal processes remain limited to surfaces lined by mucous membrane, it had until comparatively recent times, been generally doubted that the gonococcus of Neisser, without the association of the more common pyogenic organisms, was capable of inducing an acute general peritonitis. It is however, now recognized that structures other than those of an epithelial character are liable to invasion by the gonococcus and, indeed, parts covered by endothelium seem particularly liable to attack by this organism. Thus the joints, plura, peri- and endocardium are liable to gonococcal infection, and although these affections are metastatic in character, and occur during the course of a general gonococcus septicæmia, they nevertheless suffice to prove the untenableness of Bumm's original statement. Nevertheless surgeons have clung to the belief in the immunity of the peritoneum to gonococcal infection, and it has generally been granted that gonorrhœal processes in women are checked in the neighborhood of the abdominal ostia of the tubes, where by continuity of extension, a peritonitis otherwise might readily be induced. We must for the present continue to believe that such an inhibition of the growth of the organisms does usually occur when the serosa is reached, but whether under unusual circumstances a general peritonitis may not follow, by implantation of gonococci from the tubes upon the peritoneum, has hitherto been regarded as extremely improbable. The usual conception is concisely expressed in a recent paragraph by Frederick Treves,* as follows:

"Peritonitis has been met with in association with gonorrhœa, but inasmuch as the gonococcus cannot survive in the peritoneal cavity it is doubtful whether peritonitis due to the gonococcus alone has any existence. . . . . It is very probable that a mixed infection is the cause of the pyosalpinx often met with in gonorrhœa. That pyosalpinx may lead to acute peritonitis is undoubted, but it has not been demonstrated that such a complication is due to the action of the gonococcus alone; it is probably the outcome of a mixed infection. . . ."

Even among those few investigators, who have devoted their attention from an experimental as well as a clinical standpoint to the possibility of this complication of gonorrhœa in

* Fred'k Treves, Allbutt's System of Medicine. Vol. III, p. 609, 1897.

women, the subject remains one of debate for the want of one link in the chain of evidence, which it is hoped that this communication will establish.

The recent observation at the Johns Hopkins Hospital of two cases of diffuse peritonitis, due to pure gonococcal infection, which it is the design to report, has led to the following brief historical review of the literature dealing with the question outlined in the preceding paragraph.

Bumm,* in 1889, published the following statement in which the principles laid down by most subsequent writers can be seen reflected. "Ab es eine gonorrhoische Entzündung des Peritoneum giebt ist mir immer sehr Zweifelhaft gewesen. Die Mikroben der Gonorrhöe vermögen nur auf Schleimhäuten pathogene Wirkungen zu entfalten, gehen aber in Serösen Höhlen zu Grunde. Reiner gonorrhöischer Eiter, der sich aus geplatzten Tubensäcken in's Peritoneum ergiesst, wirkt in der Regel nun als aseptischer Fremdkörper. Es wird abgekapselt, etc." He goes on to say that only a mixed gonococcal infection can be followed by a septic peritonitis.

At the meeting of the German Gynæcological Society, held in Bonn, in 1891, Bumm† further emphasized his views. He believed that gonorrhœal infections ran a course as a superficial mucous membrane affection merely and never penetrated the deeper connective tissue in which the gonococcus would perish: that the organism of Neisser had nothing to do with septic processes, which occurred only through the medium of mixed infections: that the gonorrhœal process, usually localized in the urethra and cervix, under certain influences, primarily that of menstruation, but also during the puerperium, and from coition and instrumentation, might extend to the endometrium of the body and tubes. Beyond these parts, however, he believed the process did not pass, being limited by the endothelial peritoneal surface.

At this same meeting Wertheim‡ presented the results of some clinical and experimental investigations which question the assertion as to the immunity of the peritoneum in Bumm's sense, and which remain to-day the most important contribution to this subject.

His observations, which are directly in opposition to those of Bumm, demonstrated conclusively that at all events a *circumscribed* pure gonococcal peritonitis could be produced experimentally in animals and was possible in human beings.

In a carefully conducted series of experiments he found that the inoculation into the abdominal cavity of certain animals of a pure culture of gonococci, which organisms he had cultivated successfully upon human blood-serum agar, would produce a localized peritonitis, provided that there was introduced at the same time a non-absorbable material. For his purposes nutrient agar sufficed. He found, however, that even in white mice and guinea-pigs, the most susceptible of the lower animals, the process remained localized, was evanescent and never fatal. The acute circumscribed seropurulent reaction consisted of a deposit of pus cells and gonococci in great abundance on the hyperæmic serosa of the bowel. Nor was this all, for in sections the gut showed the gonococci penetrating deeply under the serosa and between the muscle bundles in ever-increasing intensity for about seventy-two hours, after which the multiplication of the organisms would cease and they would become more difficult of cultivation. The control animals would invariably recover. In his entire series of laparotomized animals no instance of mixed infection was encountered, and he recovered the introduced organisms in pure culture, and afterwards conclusively demonstrated their nature by the production of a specific anterior urethritis in man.

He further demonstrated that in a considerable percentage of cases of chronic salpingitis, which, from the absence of any growth upon ordinary media had previously been supposed to be sterile, a pure culture of gonococci could be obtained upon his blood-serum agar. Similarly from two cases of ovarian abscess he isolated pure cultures of these organisms.*

By his experimental and pathologic studies, therefore, Wertheim showed that the gonococcus was capable of multiplication upon the peritoneal serosa and in the tissues, and of inducing an acute localized, though evanescent, peritonitis. Similar occurrences in the human peritoneum and the possibility of a diffuse peritonitis of similar nature remained undemonstrated.

Wertheim† in a subsequent report published a case in which, during a laparotomy for salpingitis, he found an extensive acute pelvic peritonitis. In the exudate he demonstrated gonococci and succeeded in cultivating them on his blood-serum agar. The abdominal ends of the tubes were open and discharging pus. The fimbriæ were free from adhesions. Had the process been left to itself it would have gone on to organization of the exudate and the formation of extensive pelvic adhesions, the usual sequel of these conditions. The author believes this to be the first assured case of acute gonococcal infection of the peritoneum in a human being.

Since Wertheim's communications occasional contributions

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* Bumm, E. Zur Aetiologie der septischen Peritonitis. Münchener med. Wochenschr., Bd. XXXVI, No. 42, p. 715, 1889.

† Bumm. Ueber die Bedeutung der gonorrhoischen Infection für die Entstehung schwerer Genitalaffectionen bei der Frau. Verhandlungen der deutschen Gesellschaft für Gynäkologie, IV. Kongress, 1891, p., 359.

Ref. Centralbl. f. Gynäkologie, Bd. XV, p. 448, 1891. Ref. Journal of Obstetrics, Vol. XXIV, p. 1265, Nov., 1891.

‡ Wertheim, Ernest. Zur Lehre von der Gonorrhoe. Verhandlungen der deutschen Gesellschaft für Gynäkologie, IV. Kongress, 1891, p. 346.

Die ascendirende Gonorrhoe beim Weibe. Bakteriologische und klinische studien zur Biologie des Gonococcus Neisser. Archiv für Gynäkologie, Bd. XLII, p. 1, 1892.

Ref. Journal of Obstetrics, Vol. XXIV, p. 1379, Nov., 1891.

Ref. Centralbl. f. Bakteriologie, Bd. XII, p. 105, 1892.

* The frequent demonstration by other observers since Wertheim, of gonococci in the pus of ovarian abscesses, when the organisms are no longer demonstrable in the chronic peritonitis about the appendages, is most naturally explained on the supposition that the bloodclot of a ruptured follicle offers a more favorable culture medium for their maintenance than does the peritoneal serosa.

† Wertheim, Ernest. Ein Beitrag zur Lehre von der Gonokokkenperitonitis. Centralblatt für Gynäkologie, Bd. XVI, p. 385, 1892.

Ref. Centralbl, f. Bakteriol. und Parasiten, Bd. XII, p. 108, 1892.

to the subject have been made by various writers, all of rather negative value.

Menge,* at the Tenth International Congress in Berlin in 1891, reported the results of examination of twenty-six cases of purulent salpingitis. He found micro-organisms on eight occasions and gonococci on three, but, like Bumm, he failed to demonstrate the latter in inflammatory processes of the peritoneum. Menge, however, unlike Bumm, does not commit himself, but leaves the problem unsolved as to whether the acute and chronic pelvic peritonitides, which we find accompanying purulent gonorrhœal salpingitis, are due to a specific gonococcal infection, or to the chemical irritation of the overflowing secretion, or are the product of a definite mixed infection.

Zweifel,† in his discussion of Menge's paper, gave the conclusions drawn from a great number of personal observations, namely, that the formerly denied sequence of infection of the abdominal cavity with gonococci stood in contradiction to clinical experience. He believed in the existence of a gonococcal peritonitis, and that the organisms can be found only in the very acute cases, such as, for example, do not last longer than a week. He acknowledged, however, that definite proof to support this statement had not yet been brought forward.

Similarly Charrier,‡ in Pozzi's clinic was not able to cite a definite instance of such acute gonococcal peritoneal inflammation, although he believed in its existence. He considers it a short-lived process and one complicated, as a rule, by concomitant infection with other pyogenic cocci.

Menge reported a case to the Gesellschaft für Geburtshülfe in Leipzig, in 1893,§ in which, following the correction, under anæsthesia, of a retroflexed uterus associated with a small pyosalpinx, a general peritonitis supervened. Zweifel operated and found a double pyosalpinx with beginning general peritonitis. The pus from the tubes showed a few gonococci on culture. None, however, could be demonstrated on cover-slip preparations. The abdominal contents were negative culturally, nor could any organisms be found on stained preparations. The patient recovered and Menge believed that the peritonitis was attributable less to the micro-organisms than to ptomains present in the pus. He believed that they were dealing with a purely chemical peritonitis.

The principle which Bumm had laid down, namely, that peritoneal infection after gonorrhœa was more apt to occur after menstruation, parturition, &c., soon became emphasized by the reports of cases in the literature tending to disprove the common belief that the infection to involve the general cavity must be a mixed one. The observations alluded to did this, however, more because of negative findings of the pyogenic group than by any positive demonstration of the existence of the gonococcus alone.

Veit,* in 1893, reported five cases in which the symptoms of acute diffuse peritonitis had occurred in women in child-bed, who had become infected in two instances shortly before the confinement and in three during the puerperium. In these cases after a stormy period of a few days the threatening symptoms disappeared, leaving a condition of chronic gonorrhœal pyosalpinx. Veit declared that the peculiar anatomical condition present in the puerperal state occasioned the rapid onset of the peritonitis and offers the suggestion that possibly the lochia affords a good culture medium for gonococci, a view which Bröse† holds because of the observation that one often finds during the child-bed period, the gonococci in great abundance in old infected cases which previously were in such a quiescent state that few, if any, organisms could be demonstrated in the discharges.

Penrose‡ reports a somewhat similar case of a colored woman who, four weeks after her confinement, contracted an acute gonorrhœa, which was followed in six days by symptoms of acute peritonitis. A laparotomy was performed disclosing general peritoneal involvement with a recent double salpingitis. Both tubes were removed. Unfortunately the value of this case was lost by the failure to investigate the bacteriology of the peritonitis and the uncertainty of the pathological report on the tissues which had been removed.

Chaput,§ also cites a case in a girl of seventeen, in whom a general peritonitis followed a double pyosalpinx. The abdominal openings of the tube were patent, and pus could be squeezed from them. The patient died of "paralysis of the intestine." Chaput considered the case an example of general gonococcal peritonitis.

Körte‖ also, in his second report on peritonitis, describes a case (No. 20) in which a general peritonitis, sudden and with great collapse, followed the rupture of a pyosalpinx. The patient recovered after the laparotomy which disclosed a pronounced degree of peritonitis in the exudate of which a few intracellular diplococci were found. Unfortunately they could not with surety be demonstrated to be gonococci.

In 1896, Bröse¶ reported two cases of non-puerperal peritonitis for which he held the gonococcus alone responsible. As in Menge's case, referred to above, the cause of the peritonitis on one occasion was the rupture during manipulation of a small gonorrhœal pyosalpinx. Signs of collapse and

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*Menge, K. Ueber die gonorrhoische Erkrankung der Tuben und des Bauchfells. Zeitschr. für Geburtschülfe und Gynäkologie, Bd. XXI, 1, p. 119, 1891. Ref. Centralbl. f. Gynäkologie, Bd. XVII, p. 457, 1893.

†Zweifel. Verhandlungen des X. Internat. Medic. Congresses, Berlin, 1890. Bd. III Abeth. 8. Gynäkologie, p. 176, 1891.

‡Charrier, P. De la péritonite blennorrhagique chez la femme. Thèse de Paris, 1892.

§Menge. Ueber Laparotomie bei geborstener Pyosalpinx. Centralblatt für Gynäkologie, Bd. XVII, p. 457, 1893.

*Veit, J. Frische Gonorrhoe bei Frauen. Dermatologische Zeitschrift, Bund. I, p. 165, 1893.

†Bröse, P. Ueber die diffuse gonorrhoische Peritonitis. Berliner klin. Wochenschr., Bd. XXXIII, p. 779, Aug. 31, 1896.

‡Penrose, Chas. B. Acute Peritonitis from Gonorrhœa. Medical News, Vol. LVII, p. 16, July 5, 1890.

§Chaput. Péritonite blennorrhagique, etc. Bulletins de la Societé Anatomique de Paris. Annee 69, p. 9, 246, 1894.

‖Körte, W. Weitere Bericht über die chirurgische Behandlung der diffusen Eiterigen Bauchfellentzündung. Mitteilungen aus den Grenzgebieten der Medizin und der Chirurgie, Bd. II, p. 167, 1897.

¶Bröse, P. Loc. cit.

general peritonitis followed. In the light of Wertheim's and Veit's observations, Bröse, although urged to intervene, withheld operation, and after four days the symptoms subsided. His second case was one of a spontaneous rupture of a gonorrhœal tube. Here also extreme symptoms, not only of pelvic, but of a generalized inflammation with profuse vomiting, extreme meteorism and collapse so marked that the case looked hopeless, followed. Again operation was withheld, and by the sixth day all symptoms had subsided. Bröse naturally believed that these peritonitides, differing so greatly in their course and prognosis from the ordinary streptococcus and staphylococcus invasions, represented a distinct form of peritoneal infection. Their symptoms, such as great pain, general tenderness, vomiting, meteorism, singultus, high temperature, small and frequent pulse, are the same as those of general peritonitis from any cause. Their prognosis is however widely different, as complete recovery, except for the chronic condition left in and about the appendages, is the usual outcome. He acknowledges, however, that as no case has been confirmed by section, the pathologic anatomy and the bacteriology of "gonorrhœal peritonitis" are only matters of conjecture.

During the discussion* which followed Bröse's report, the apparent verdict was "not proven." Dührssen believed that he had seen two cases similar to those reported, and he had treated them also in an expectant manner. He regarded the fresh cases, where only endo-salpingitis existed, as the most dangerous for the production of general peritonitis, for in them the abdominal ostia are not closed. A previous pyosalpinx with adhesions naturally renders its occurrence less likely. Baginsky, at this time reported a fatal case in a child following a vulvo-vaginitis of gonorrhœal origin. Unfortunately no note was made on the bacteriological findings of the peritoneum at autopsy. Kiefer expressed doubt as to the extent of the process in Bröse's cases, believing that a local peritonitis might have given similar symptoms. He truly said, "Einen wirklich einwandfreien Fall von diffuser gonorrhöischer Peritonitis giebt es bis jetzt nicht."

Bland Sutton† later in the same year briefly reported a case which almost filled the requirements demanded by Kiefer. It was that of a young girl presenting acute abdominal symptoms supposed to be of appendicular origin. On opening the abdominal cavity he found pus leaking from the ostia of the tubes, which were as large as the thumb, and a general peritonitis of a peculiar form with free purulent fluid described as "gummy." This fluid contained "myriads of micrococci and an abundance of gonococci." The patient was found subsequently to have had a vaginal discharge for three months.

The infection here was regarded as a mixed one, though the variety of "micrococci" was not given. Bland Sutton's report is brief, and no note is made concerning any relation to catamenia or other ætiological factor in the spread of the infection.

If this case is to be regarded as one of general gonococcal peritonitis, it and Wertheim's (l. c.) are the only two which I have been able to discover in a careful search of the literature which carry any convincing proofs of such an origin.

It is hoped that the two following cases, in which the condition was unsuspected and the diagnosis not made until the gonococci were demonstrated in the abdominal cavity, are sufficiently conclusive to establish beyond question the existence of a diffuse pure gonococcus peritonitis.

Case I.—Surg. No. 7719.—*Acute Abdominal Symptoms during Menstruation and following Gonorrhœa. Laparotomy. General Peritonitis. Recovery.*

Mollie C., a maid, aged 25 years, was admitted to Dr. Osler's service May 20, 1898, complaining of abdominal pain.

Her history given on admission was without note. There was nothing to call attention to any pelvic disturbance. She denied the possibility of gonorrhœal infection, and a cursory pelvic examination was negative. Catamenia had always been regular.

The patient stated that four days previously her usual menstrual period had begun. Two days later after an exposure to cold, having fallen asleep in a draught while drying her hair, the flow partially ceased. The same day she began to have some sharp colicky pains in the abdomen and back, but kept at work until the day before admission, when the pain became more severe and quite constant. She remained in bed. Her bowels were constipated. She had some pain in the abdomen during evacuation of the bladder. The next day she was admitted to the medical wards from the dispensary by Dr. Frank R. Smith.

On admission the patient was very much excited and restless, and the history and examination were equally unsatisfactory. The temperature was 100.5°; pulse 110, of good quality; respiration not accelerated. A leucocytosis of 19,000 was present. She was flushed and had a thickly coated tongue. She lay with her knees drawn up.

The abdomen was symmetrical, somewhat full in the umbilical region. Liver dullness extended from the sixth rib to the costal margin. Neither liver nor spleen were palpable. There was no dullness in the flanks; no rose-spots. The only areas of tenderness which the patient acknowledged were in the upper zone of the abdomen. Some muscle spasm was elicited on palpation there. There was no rigidity. Rectal and vaginal examinations were negative (though the patient subsequently said they gave her great pain).

The following day the symptoms became more pronounced. General abdominal tenderness was more marked; the temperature rose to 102.8°, the leucocytes to 22,000. She was transferred to the surgical side for exploration.

Operation May 21, 1898, ether anæsthesia.

Median exploratory laparotomy. General peritonitis. Acute double salpingitis. Gonococci demonstrated. Salpingectomy. Peritoneal toilette. Drainage.

An incision was made through the inner border of the right rectus muscle. On opening the peritoneal cavity no free fluid, but a deeply injected serosa quite universally covered with a deposit of yellow fibrin, was found. The appendix was immediately sought for. It was deeply injected and covered with flakes of "lymph," but there was no evidence of perforation, adhesions or anything identifying it as the source of trouble. Cultures and coverslip preparations were made from the surface of the appendix, and a flake of fibrin was removed for examination. While the coverslips were being examined a systematic examination of the abdominal viscera was made.

* Berliner klin. Wochenschr., Bd. XXXIII, p. 261, Mar. 23, 1896.

† Sutton, J. Bland. Some interesting pelvic cases. Brit. Med. Journ., Vol. II, p. 1309, Oct. 31, 1896.

The serosa of the uterine appendages and pelvis presented no evidences of an older process than that covering the appendix and right iliac fossa. The incision was enlarged and the small bowel evertrated while the region of the stomach, liver and gall-bladder were explored. No perforations could be found. There was the same injection and deposit of lymph everywhere. The under surface of the liver was covered quite uniformly with a thick deposit. The coverslip examination meanwhile was reported as showing a deeply staining biscuit-shaped coccus, for the most part intracellular, occurring in pairs and not decolorizing by Gram's method. This led to a further examination of the Fallopian tubes. Like the rest of the exposed viscera, they were deeply congested and quite abundantly covered with lymph; they were somewhat swollen, but not markedly so. There were no adhesions of any note about them, and the fimbriæ were free. Both appendages presented the same appearance. On gently squeezing the tube and stripping it toward the free end a thick drop of purulent material could be made to appear much like that seen at the external meatus in gonorrhœal urethritis in the male. An abundance of organisms with the morphology of gonococci were demonstrated in the pus.

Both tubes were removed. The abdominal cavity was thoroughly irrigated with salt solution, and much of the lymph wiped away with salt sponges. The abdominal wound was partly closed, and two drains of gauze wrapped in rubber protective were left leading to the stumps of the tubes.

The patient was quite ill for two days after the operation; restless, with dry tongue, meteorism, vomiting and general appearance of peritoneal infection. She subsequently made a complete recovery. The protective wicks were withdrawn on the fourth day and the wound closed immediately. Doubtless the drainage was unnecessary.

There was a little irregular bloody discharge from the vagina, with some leucorrhœa for a few days. No organisms could be positively identified as gonococci in the urethral or vaginal secretions.

After the operation this additional note was obtained from the patient. She had been exposed to infection for five years or more, and for two years had had some menstrual irregularity, the flow at times being replaced by leucorrhœa. For some months she had had quite a profuse leucorrhœa and considerable burning pain with micturition. She had been exposed to re-infection a few days before her menstrual period.

BACTERIOLOGICAL REPORT BY DR. HUGH H. YOUNG.

Peritoneum—Smears and cultures were made from the large flakes of fibrin which were adherent to the intestines; very little fluid pus present. The smears showed pus cells and fibrin without bacteria. Cultures made on agar slants are negative after several days in the thermostat.

Cultures on ascitic-fluid agar (inoculated with pus and fibrin which had been on an agar-slant for twenty hours) show no growth after many days in the thermostat.

Fallopian tube; surface burned; tube incised with sterile knife. Smears from pus show leucocytes and epithelial cells, and numerous bacteria resembling morphologically the gonococcus. Most of them are inclosed within leucocytes in numbers varying from two to sixteen, typical biscuit-shaped, grouped generally in pairs, sometimes in tetrads. No other bacteria present. After Gram's stain all are discolorized.

Diagnosis, *gonococcus*.

Cultures were unfortunately not taken from the tubes.

Note.—The negative result of inoculations of large amounts of fibrin and pus from the peritoneal cavity upon ordinary agar slants practically excludes the possibility of the presence of the ordinary organisms of peritonitis.

The absence of growth on ascitic-fluid agar signifies nothing, as the medium was inoculated from the surface of an agar-slant twenty hours old. While the positive cultural evidence of the presence of the gonococcus in this case would have been desirable, the certain identification of the organism in the tube and the absence of growth on the ordinary media makes the diagnosis of gonococcus infection convincing.

The demonstration in this case of gonococci on coverslip preparations from the peritoneum made and examined during the operation showed that the peritonitis was not simply of a chemical nature, as the negative cultural findings upon the ordinary media inoculated in the operating room might otherwise have led us to believe. The routine immediate examination of the flora of the exudate in cases of peritonitis often is of the greatest service to the operator, and may give a distinct clue to the prognoses and proper treatment of the case. Had no such examination been made in this instance possibly the source of the infection might not have been recognized, and not improbably the peritonitis have been regarded as a chemical one, as Menge believed it to have been in his case. Negative bacterial results have characterized nearly all of the observations previously mentioned in this report, except the experimental ones of Wertheim. Whether "chemical" peritonitis, so-called, has any actual existence remains a question of doubt. Tavel and Lanz* recognize such a condition, while Flexner† has never failed to find organisms in his 106 cases of peritonitis examined after death. The pathologist doubtless may be less likely to encounter these rather benign cases than the surgeon, but it is possible that some of the "chemical" cases described by surgeons may be, after all, of bacteriologic origin, though difficult to recognize, as was the one here reported.

CASE II.—Surgical No. 7760.—*Acute abdominal symptoms during menstruation simulating appendicitis. Laparotomy. General peritonitis. Recovery.*

M. B., a factory girl, aged 18, was admitted to Dr. Osler's service May 30, 1898, complaining of pain in the right side of the abdomen, with persistent nausea and vomiting. The meagre history relative to her condition which could be obtained at entrance was as follows: Six days previously she was awakened in the morning with abdominal pains so severe that she could not get up. Up to this time she had been perfectly well. Her bowels were constipated for some days after this onset, and she had been constantly nauseated with frequent spells of prolonged vomiting, which had increased of late. She had been hiccoughing some. All disturbance with micturition and menstruation was positively denied at this time. Her pain had been constant and always in the right

*Tavel, E., und Otto Lanz. Ueber die Aetiologie der Peritonitis. Mittheilungen aus kliniken und medicinischen Instituten der Schweiz, I Reihe, I Heft., 1893.

†Flexner, Simon. The Etiology and the Classification of Peritonitis. Philadelphia Medical Journal, Nov. 12, 1898.

iliac fossa. She had had no chill and was unaware of any pyrexia. Her general appearance was that of collapse, with peritonitis.

She was seen by Dr. Halsted in consultation with Dr. Thayer, and a provisional diagnosis was made of general peritonitis presumably of appendicular origin.

She was immediately taken to the operating room, where the following note was made before anæsthetization: "The patient is a young woman with flushed cheeks, a thickly-coated tongue and a general appearance of acute toxæmia. Her respirations are costal in type, somewhat accelerated—thirty-four to the minute. Pulse is 100, rather small, but regular and fairly good quality. Temperature is 98.6°. Her extremities are cold, but not clammy as from collapse. There is a leucocytosis of 26,000.

Abdomen.—There is no distention. On the left side there is no rigidity or muscle spasm and no apparent tenderness. Tenderness on the right side is marked, but protective spasm is not a prominent feature. There is a definite point of tenderness two or three centimetres to the right of the umbilicus on a line to the anterior spine. Percussion note has about the same quality over the whole abdomen, with no dullness in the flanks."

The patient insisted that her chief tenderness was in the epigastric region. A vaginal examination which had been made in the ward previously was reported as negative, except for an absent hymen and slight vaginitis.

Operation May 30, 1898, 2 P. M. Ether anæsthesia.

Exploratory laparotomy. General peritonitis. Gonococci demonstrated in exudate. Double salpingectomy. Irrigation and drainage.

An incision was made over the site of the appendix. On opening the peritoneal cavity the whole serosa was found greatly injected and quite uniformly covered with a layer of fibrin. There was no free fluid; no pus. The appendix was found to be deeply congested and covered with "lymph," but in no respect differing from the appearance of the rest of the bowel. The distribution of the exudate was so uniform that (as in Case I) there was nothing to draw attention to any particular organ in searching for the origin of the peritonitis.

The under surface of the liver, the spleen, stomach and pelvic viscera, all were deeply injected and more or less thickly covered with exudate. This seemed especially abundant on the under surface of the liver, from which it could be peeled off in large flakes, leaving a raw surface exposed.

The tubes were examined early in the search, as the peculiar character of the peritonitis resembled so closely that seen in Case I. They were, like the appendix, congested and covered with lymph, but the fimbriæ were free and there was no evidence that the pelvic peritonitis antedated that in the upper portion of the abdomen. Only after a careful examination of the gall-bladder, stomach, mesenteric glands and bowel were the tubes re-examined when, with some difficulty, it was found that a purulent drop could be brought to the abdominal ostium.

Coverslip preparations were immediately made from this pus, and a biscuit-shaped diplococcus decolorizing by Gram's method was demonstrated in moderate numbers. Cultures were made on various media from this material and from different parts of the abdominal cavity, and a sheet of fibrin about three centimetres in diameter was stripped from the under surface of the liver for future study, and by chance was dropped in a bouillon tube.

Both tubes were removed, the pelvis was carefully wiped out with saline sponges, the intestines irrigated and much of the thick fibrin sponged off. The abdominal wound was partly closed, leaving a small drain leading into the pelvis.

The patient made a satisfactory and complete recovery.

An attempt, made subsequent to the operation, to demonstrate gonococci in the vaginal discharge was unsuccessful. The following important feature of the history was obtained after the operation. She had been frequently exposed to infection for a year and had had considerable leucorrhœa for six months, with some burning and cutting pain during micturition. Several days before her last menstrual period she was re-exposed after a long interval of freedom, and had a return of abundant discharge. Menstruation began as usual, but ceased after three days with the onset of the abdominal pain and vomiting, leucorrhœa and ardor. The patient to protect herself had referred her pain to the epigastric region, and denied any tenderness on pelvic examination.

The appendicular tenderness is an interesting feature. Possibly the great congestion of the organ may have been responsible for the tenderness on pressure near McBurney's point.

RACTERIOLOGICAL NOTES BY DR. YOUNG.

May 30, 1898—A coverslip preparation from the purulent contents of the right tube shows many pus cells and a considerable number of diplococci, with typical morphology of the gonococcus, mostly intracellular. Some cells contain a number of cocci, one showing as many as twenty-five. All completely decolorized by Gram's method.

Diagnosis, *gonococcus.*

Smear from peritoneal cavity (poor preparation; stains badly) shows four typical gonococci, all intracellular; too few to decolorize.

Cultures: 1. Bouillon culture from pus from peritoneal cavity shows no growth after three days in thermostat.

2. Another bouillon tube, into which a large mass of fibrin stripped from the under surface of the liver was dropped, shows slight cloudiness in the bouillon at the bottom of the tube (around the fibrin) after three days in the thermostat. Coverslips made from this show numerous, fairly large diplococci, biscuit-shaped and otherwise typical, morphologically, of the gonococcus. Numerous coverslip preparations were made, and all show diplococci in great numbers and nothing else. All decolorize by Gram's method.

Cultures from this bouillon and also from the fibrin show no growth on ordinary agar after many days in the thermostat.

3. A hydrocele fluid-agar tube was inoculated with a small mass of fibrin which was removed from Douglas' pouch. After twenty-four hours in the thermostat five small, transparent, pin-point colonies were seen on the surface of the medium adjacent to the fibrin. At the end of forty-eight hours they are as large as a small pin-head and semi-translucent in appearance.

Slide-smear preparations show diplococci, morphologically the same as gonococci in pairs and tetrads. All are completely decolorized by Gram.

Transfers on agar from colonies on the hydrocele-agar show no growth after many days in the thermostat.

Diagnosis, *gonococcus.*

Note.—The growth of the gonococcus in ordinary bouillon into which a large mass of fibrin had been dropped is interesting. As is well known, the gonococcus grows well in Marmorek's human serum bouillon (composed of one-third human blood-serum and two-third bouillon) and it seems probable that the fibrin in this instance added the chemical ingredients which sufficed to convert the ordinary bouillon into a fluid resembling this mixture.

The growth was very abundant, and the typical morphology,

decolorization by Gram, and negative growth on agar made the diagnosis of gonococcus positive.

The fact that this culture was taken from just beneath the liver is also conclusive evidence that the gonococcus infection was general throughout the peritoneal cavity.

The similarity of these cases is very striking. In both there was a diffuse involvement of the general peritoneal cavity occurring during menstruation and following a recent exposure to infection associated with the exacerbation of a preëxisting leucorrhœa. Apparently the uterus and tubes at such a time are less able to resist invasion, and an acute gonorrhœal process may the more rapidly ascend from the cervix through the patent abdominal ostia to the serosa. In both cases the onset of abdominal symptoms was sudden with pain and vomiting, but without the shock and collapse seen in perforative peritonitis. In neither case was abdominal tenderness a marked feature, nor was there any distention from paralysis of the bowel as would have been expected with such a pronounced degree of peritonitis under ordinary circumstances. No information was gained by pelvic examination, as both patients concealed the nature and seat of the trouble. The examination of the appendages, however, under more favorable circumstances would have been negative, as the tubes were patent and there had been no accumulation in the lumen. Leucocytosis was pronounced in each case.

The character of the peritonitis in both was the same; a dry fibrinous peritonitis having, as Bröse has said, a distinct individuality. There was practically no pus or serous exudate. In the pelvis there was no evidence that the process had been of longer duration there than elsewhere. The whole serosa was uniformly injected and the deposit of fibrin on the liver and spleen was so thick that it could be stripped away, showing that there was an extensive dissemination of the infectious agent, whether the gonococcus itself or some chemical product of its growth. The fibrinous pseudo-membrane, however, was not essentially of the adhesive kind. Adhesions even in places where the "lymph" was thickest were not a pronounced feature.

From our knowledge of the self limitation of the gonococcal peritonitides and from Bröse's clinical observations, it seems probable that both of these cases might have recovered without operative intervention, but probably with a following chronic pyosalpinx which would subsequently have demanded operation.

Microscopical sections of the tubes showed, especially in Case I, an advanced degree of endo-salpingitis with leucocytes and broken-down epithelial debris in the lumen, and great congestion of the sub-epithelial tissues, which contained many leucocytes with greatly fragmented neuclei. The tubes in Case II showed a much less marked catarrh; one of them indeed (left), being only slightly abnormal. This case, however, showed possibly the most advanced peritonitis and the more severe symptoms. Attempts to demonstrate the organisms in the stained sections were unsuccessful.

The gonococcus has made a place for itself as one of the most important pathogenic bacteria. Few organisms, not even the bacillus typhosus, rival it in the number of suppurative sequelæ which may follow a primary infection. Its occurrence in the conjunctiva, and in the iris, the joints, bursæ and tender sheaths; its occasional demonstration, as the cause of endo- and pericarditis, pleuritis and phlebitis, and the recent observations of cases of pure septicæmia* with its cultivation from the blood shows that its possibilities for metastatic complications are as numerous as are those arising from the spread of infection by direct continuity of surfaces. A general peritoneal involvement by direct extension of an unmixed gonorrhœal process, though long considered among these possibilities has heretofore remained unproven. It adds another variety to the peritonitides of mono-infection which are rare except when of hæmatogenous origin.

Conclusions.

1. The gonococcus is capable of causing a specific infectious disease, namely, gonorrhœa and at the same time other and less specific pathological conditions.

2. There is experimental proof that in certain small animals the gonococcus can set up acute alterations in the peritoneum homologous with the acute septic serositides in man, but differing from these in their tendency to rapid and spontaneous healing.

3. Hitherto there has been wanting conclusive proof that in the peritonitides attendant upon gonorrhœa occurring in women, the gonococcus was solely or chiefly concerned. The inflammations had been variously regarded as mixed infections and chemical inflammations.

4. The cases reported in this paper bring for the first time convincing evidence of the existence of a diffuse, general inflammation of the abdominal cavity caused by the gonococcus.

5. It has been recognized that extension of the gonorrhœal infection from the genital organs to the peritoneum may occur in the puerperal state; a similar sequel is shown to be possible during menstruation.

6. Such ascending forms of gonorrhœa doubtless under ordinary circumstances remain localized in the pelvis, and rarely demand surgical investigation in the acute stage.

7. A general involvement of the peritoneum such as occurred in the two cases given, must either be rare or unrecognized, and may depend upon some especially receptive condition of the serosa or virulence of the organism.

8. The peritoneum is not more immune than are the peri- or endocardium to gonococcal infection, and being more exposed, suffers more commonly in females, although the relatively benign course of the disease makes it a rare condition to come to the attention of the surgeon in the acute stages.

*Colombini, P. Bakteriologische und experimentelle Untersuchungen über einen merkwurdigen Fall von allgemeiner gonorrhoischer Infection. Centralbl. f. Bakteriologie, u. s. v., Bd. XXIV, No. 25, p. 955, Dec. 30, 1898.

Thayer and Lazear. A second case of gonorrhœal septicæmia and ulcerative endocarditis, &c. The Journal of Experimental Medicine, Vol. IV, No. 1, pp. 81, 1899.

A CASE OF ATROPHY OF THE OPTIC NERVES FOLLOWING HEMORRHAGE FROM THE STOMACH, WITH A CONSIDERATION OF THE CAUSES OF POST-HEMORRHAGIC BLINDNESS.

By Samuel Theobald, M. D.,

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Loss of vision as a consequence of hemorrhage from the stomach is an occurrence of sufficient rarity to warrant the reporting of every well-authenticated case of this character. In a paper upon "Amaurosis and Amblyopia after Hæmatemesis," by Dr. Ed. Pergens, of Brussels, in the January number of the Annales D'Oculistique for 1896, the author, after a seemingly exhaustive search of the literature of the subject, has been able to bring together data of but 64 published cases, two of these being newly reported cases of his own.

The unanimity with which the text-books upon diseases of the eye mention excessive hemorrhage, and especially hemorrhage from the stomach, as one of the causes of optic neuritis, would seem to indicate that cases of this character are of not infrequent occurrence—a conclusion scarcely warranted, I am inclined to believe, by the facts.*

Briefly reported, the case which has recently come under my observation is as follows:

A. B., æt. 57, formerly a lumberman of West Virginia, and more recently a restaurant keeper in one of the small towns of that State, was first seen December 5, 1898. He gave a history of serious disturbance of the stomach of twenty years' duration, the most prominent symptom being frequently repeated attacks of vomiting. On the 6th of May (1898) he had, for the first time, a hemorrhage from the stomach. It was of severe character, and was followed, at intervals of forty-eight hours, by two other equally severe hemorrhages. The loss of blood was so great that his life was despaired of, and he was confined to bed for six weeks. For part of this time (two or three weeks), according to his account, he was in a semi-conscious state—was aware of the presence of people about him and could hear their voices, but could not speak to them or express his wants.

On the day of the second hemorrhage his sight, which had previously been good, became greatly impaired, and his belief is that during the two succeeding weeks he was "entirely blind." At the end of this period his vision began to improve, and he was able to see people moving about the room. This improvement in vision continued, so that by the last of June or first of July he could see well enough to walk upon the streets without guidance; and this amount of vision he retained until about the middle of November, when his sight began again to decline. The decline from this date was pretty rapid, so that when I saw him he had to be led about like one entirely blind. He admitted that he had been a pretty constant smoker, but denied having been a hard drinker, and also denied having had syphilis.

The condition of his stomach was carefully investigated by Dr. Osler and Dr. Thayer, who found a nodular mass near, and partially occluding, the pyloric orifice, which they regarded as the result of a chronic ulcerative process, the indications pointing to a more recent development of a malignant growth in the old cicatricial tissue.

The examination of the eyes gave results as follows: Pupils semi-dilated, somewhat oval in shape and entirely unresponsive to light. The ophthalmoscope showed advanced atrophy of both optic nerves, with some cupping, and marked contraction of the retinal arteries. The optic discs had a woolly appearance, their outlines were irregular and ill-defined, and in each eye there were pigment changes in the retina, not only about the margin of the disc but at points some distance from it and especially in the macula region, indicating that the atrophy of the nerves had been preceded by an inflammatory process which had involved the retina as well as the optic nerves. Upon testing his vision, I found that with each eye he was able to count fingers at about 12″, but only in a very limited part of the field, which in each eye was slightly to the temporal side of the central fixation point.

After an interval of eight days, he having meantime been under treatment in the Johns Hopkins Hospital, he thought his sight somewhat better, and I found that he could then distinguish with each eye Snellen C. at about 10″. An attempt was made at this time to take his visual fields; but this was very difficult and the result unsatisfactory because of his macula blindness and consequent inability to maintain central fixation. The result obtained in the right eye is shown in the accompanying diagram; the attempt as to the left eye was abandoned. Although there seemed but little probability that his sight could be improved by any plan of treatment, he was placed upon small doses of hydrarg. biniodid. with potassium iodid. and increasing doses of strychniæ sulphas.

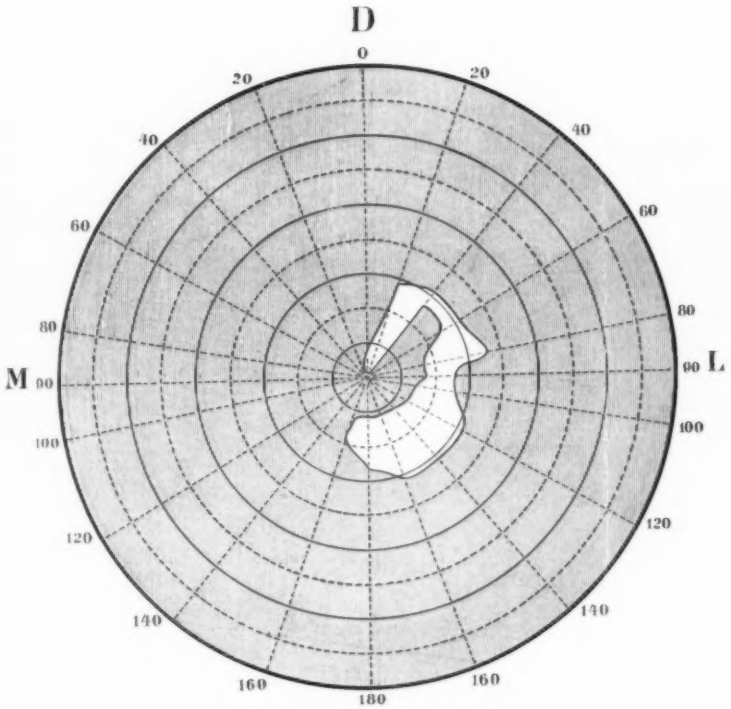
Although, as has been said, the text-books, almost without exception, speak of loss of sight following severe hemorrhage from the stomach, usually ascribing this result to optic neuritis, they have but little to say as to the way in which the loss of blood induces such disturbances in the visual apparatus.

The theory, advocated by Samelsohn* and others, that the optic neuritis is not due to the loss of blood, but that it and the diseased condition of the stomach which induces the hæmatemesis are both dependent upon a central lesion, probably in the optic thalamus, does not seem to be tenable; for we know that other severe hemorrhages, as well as those from the stomach, are followed by loss of sight. Thus Fries† states that while 35½ per cent. of the reported cases of amblyopia from loss of

* I have been able to find in the Catalogue of the Surgeon General's Library, under the title "Inflammation of the Optic Nerve," but a single reference to optic neuritis following hemorrhage.

* Graefe's Arch., Vol. XXI, 1, p. 150.

† Klinische Monatsblätter f. Augenheilkunde, 1878.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blood were due to hemorrhage from the stomach and intestines, 25 per cent. were due to uterine hemorrhage, 25 per cent. to abstraction of blood, $7\frac{3}{10}$ per cent. to epistaxis, $5\frac{2}{10}$ per cent. to bleeding of wounds, and 1 per cent. each to hæmoptysis and hemorrhage from the urethra.

The theory of Westhoff and Ziegler that the loss of vision is caused by a primary fatty degeneration of the optic nerve induced by ischæmia; as well as that of Hoffman, who attributes the amblyopia and the subsequent atrophy of the optic nerve to a retro-bulbar neuritis, seems to receive but little support from the evidence afforded by the ophthalmoscope in the majority of the reported cases.

In the paper of Pergens, already referred to, a brief abstract is given of each one of the sixty-four cases of amaurosis and amblyopia following hæmatemesis which he was able to find upon record. In a considerable number of them no ophthalmoscopic examination was made; in forty-three instances the ophthalmoscopic findings are given, but the time at which the examination was made varies greatly in different cases.

If we decide, arbitrarily, to regard all the ophthalmoscopic examinations made within three weeks of the onset of the eye symptoms as *early*, and all after this period as *late* examinations, it will be found that 20 of the 43 cases belong in the first category and 23 in the second. The early examinations are, of course, the more instructive. Now, after a careful consideration of the findings in these earlier examinations, it seems to me that, while a very few of them might, perhaps, be cited as supporting the theory of primary fatty degeneration of the optic nerve of Westhoff and Ziegler, the great majority of them point strongly to an obstruction of the blood current in the central retinal artery as the cause of the subsequent intra-ocular manifestations; and, in view of the well-recognized tendency to the formation of thrombi in post-hemorrhagic anæmia, it seems highly probable, if this theory is correct, that the obstruction was of thrombotic origin. This seems the more probable because there is, I believe, a reason why the disposition to thrombosis after loss of blood should manifest itself especially in the retinal vessels.

The occurrence of thrombi after excessive hemorrhage is to be explained by the reduction of blood pressure and the consequent slowing of the blood current, the alteration in the condition of the blood itself (especially the multiplication of the platelets), and, probably, also by changes (consequent upon anæmia) in the vessel walls. Now in the retinal circulation, beside all these general conditions, we have, in the intra-ocular tension, a special condition tending further to obstruct the enfeebled blood current. Here then, it would seem, at the point where the central retinal artery pierces the lamina cribrosa and becomes subject to the intra-ocular pressure, the ideal conditions for the development of a thrombus exist; for here we have the especial point of constriction or obstruction behind which, when other conditions are favorable, a thrombus is prone to develop. The intra-ocular pressure, doubtless, impedes the blood stream in the retinal veins also, but probably not to the same degree as in the arteries.

The ophthalmoscopic picture in thrombosis of the central retinal artery is much the same as is found in embolism of the artery, namely, paleness of the optic disc, marked contraction of the retinal arteries, less marked contraction of the veins, opacity of the retina, especially about the disc and the macula, a cherry-colored spot at the macula, and occasionally, hemorrhages; indeed there are grounds for believing that many of the cases which in the past have been regarded as *embolism* of the central artery of the retina were, in fact, cases of *thrombosis.**

Having in mind this picture, let us consider, more in detail, the ophthalmoscopic findings described in Pergens' paper and see in how far the two agree. In the twenty earlier examinations, which, as before stated, are the more instructive, we find recorded the following conditions:

	Cases.
Arteries contracted	5
Vessels contracted, especially arteries	2
Vessels contracted	2
Arteries filiform, veins very thin	1
Arteries contracted, veins dilated	3
Total in which there is mention of contracted arteries	13
Optic disc, pale	11
Optic disc, greenish-gray	1
Optic disc, clouded	2
Optic disc, clouded and white	1
Total in which there was ischæmia of the disc	15
Cloudiness of the retina	7
" " " with cherry-colored macula	2
White plaques, miliary exudates, etc., in retina	3
Total in which there were characteristic changes in the retina	12
Hemorrhages in retina or upon optic disc	8

Here we have in, at least, three instances the typical picture of obstructed arterial circulation—the case in which the arteries were filiform, and the two cases in which there was clouding of the retina with the red spot at the macula—and in all of the others it is safe to say, I think, that the conditions present may be accounted for more satisfactorily upon this theory than upon any other.

Besides these there are two cases in which the retinal vessels are described as normal (vision being recovered in each); one in which the arteries were slightly enlarged and tortuous and the veins greatly so; one in which the veins were dilated and hemorrhages were present in each eye; and one in which there was a picture of "arrested circulation," all the retinal vessels being increased in size. In the three last-mentioned cases the indications point to interference with the venous circulation rather than with the arterial. This might be explained by the occurrence of a hemorrhage into the sheath of the optic nerve, as suggested by Samelsohn, or by thrombosis of the central retinal vein, although it cannot be said that the characteristic signs of this latter condition were present in any one of these cases. In this connection, however, it is of interest to mention a case of marked impairment of vision following a severe uterine hemorrhage, observed by Dr. Harry Friedenwald, of Baltimore, in which the ophthalmoscope showed in each eye the typical picture of thrombosis of the

* Kern. Zur Embolie d. Art. centr. Retinæ. Inaug. Diss., Zürich, 1892.

central retinal vein. The vision of one eye was regained, but that of the other was permanently lost.

As to the evidence afforded by the ophthalmoscope in the twenty-three cases described by Pergens in which only a late examination was made, it cannot be claimed that it throws much light upon the question under consideration; for the atrophied nerves and contracted arteries usually mentioned as present might have been due to other conditions as well as to thrombosis of the central artery, and this is equally true of the case which I have reported.

The character of the visual field in my case, as well as that in several of the small number of cases in Pergens' paper, in which the field is described (vision having been retained only in a circumscribed area in the temporal field) is significant, and seems to point to the partial preservation of the retina in the neighborhood of the papilla by means of the cilio-retinal arteries.

Of the whole number of cases collected by Pergens, autopsies were made in but four. In one of these a thrombosis of the splenic artery was found, but no mention is made of the condition of the eye. In a case reported by Hirschberg* there was complete atrophy of the optic nerve of one eye, and atrophy of a limited portion of the optic nerve of the other eye. In the affected portion of the nerve there were numerous blood-vessels with thickened walls but no thrombosis and no signs of hemorrhage in the optic nerve sheath. The death of the individual, it should be stated, did not occur until three years after the loss of vision.

In an autopsy by Ziegler,† twenty days after the attack which led to loss of vision, no macroscopic changes in the optic nerves or their sheaths were found; but the microscope showed fatty degeneration of the nerves and their intra-ocular expansion.

The only other autopsy was one made by Raehlmann.‡ All the arteries presented constricted lumina from a fibrous endarteritis. The veins also had undergone slight constriction, in two places being almost totally obliterated. There was œdema of the retina, especially in the neighborhood of the disc. In the choroid the endarteritis was pronounced and there was hyaline degeneration. Here, too, it will be seen, we have mention of vascular changes, the thrombosis of the splenic artery in the first-mentioned case being, at least, suggestive, and the condition of the retinal vessels and of the retina itself in Raehlmann's case being especially significant.

The fact that both eyes are so frequently involved in blindness dependent upon acute anæmia* seems, at first sight, to make against the theory that the loss of vision is due to thrombosis of the central retinal artery, since it implies the occurrence nearly simultaneously, at different points, of two thrombi; but, if the intra-ocular tension plays as important a rôle in the etiology of these cases as I believe it does, this objection loses much of its force.

Conclusions.

1. That the weight of evidence afforded by the ophthalmoscope points to thrombosis of the central retinal artery as the usual cause of the blindness which occurs in post-hemorrhagic anæmia.

2. That the resistance offered to the already enfeebled blood current in the central retinal artery by the intra-ocular tension is an important etiological factor in determining this result.

3. That, in exceptional instances, the ophthalmoscope indicates that the thrombosis occurs not in the artery but in the central retinal vein.

4. That, in other exceptional instances, it may be that the loss of sight and the ophthalmoscopic changes which accompany it are the result of a hemorrhagic or serous effusion into the optic nerve or its sheath (Samelsohn). And here, again, the obstruction and damming back of the blood current in the central retinal artery by the intra-ocular tension, probably, have much to do with bringing about this result.

* Zeitschr. f. klin. Med., Vol. IV.

† Ziegler und Nauwerck's Beitr. z. path. Anat., Vol. II.

‡ Fortschr. d. Mediz., 1889, p. 928.

* Whether one or both eyes were affected is stated in fifty-seven of the cases collected by Pergens. Of these, both eyes were involved forty-nine times; one eye only eight times.

LICHEN SCROFULOSORUM IN A NEGRO.

By T. Caspar Gilchrist, M. R. C. S., L. S. A.,

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(*From the Pathological Laboratory of the Johns Hopkins University and Hospital.*)

This case is of interest not only on account of its great rarity in this country, only four cases having been previously reported, but also because it is the first recorded instance in the negro. In the four cases already reported, one of which occurred in Canada, no microscopical examination was made.

While attending a number of negro children in an orphan asylum for tinea tonsurans, one young girl, eleven years of age, was brought to me with some lesions on the back and thighs which the attendant thought were ringworm patches and which had been noticed a few days previously. The patient appeared to be a healthy, well-nourished girl; she was not anæmic, did not complain of anything, had a good appetite but was rather quiet in her manner. The tongue was clean. On examination there were found on the upper portion of the back a number of round and oval patches varying from about 10 to 20 mm. in diameter. A few similar patches were found on the extensor surfaces of both thighs, about the left groin, on the anterior surface of the right thigh and in the

pubic region. The patches all consisted of groups of small, conical, slightly scaly and therefore whitish firm papules, each papule being about 0.5 mm. in diameter, raised and presenting a flattened summit which was covered with a somewhat adherent but not profuse whitish scale, on removal of which a bleeding surface was exposed. The papules presented in every patch exactly the same character and were always discrete and of the same size. There was a slight red areola surrounding the base of the papules. The most recent patch presented a group of seven rather closely aggregated conical papules which were not scaly. The oldest groups which were in the groin were much larger and the central portion appeared to be clearing up, although on close examination one could still detect the remains of slightly scaling papules which were much flattened. Many of the lesions were pierced by lanugo hairs and were therefore situated around hair follicles. Two patches on the left groin were becoming confluent and thus formed an irregularly shaped area.

This case was not diagnosed absolutely at first, and numerous scales were examined in the usual way for the ringworm fungus but no evidence of any mycelium or spores could be found. The patient was seen every other day and numerous new lesions were observed developing, especially on the back as well as on the abdomen, forearms, and arms. Five weeks after the first appearance of the eruption a typical phlyctenular conjunctivitis of the right eye developed. The diagnosis was confirmed by Dr. Theobald. The distribution of the lesions at this time was as follows: A few scattered patches on the extensor surfaces of the forearms and arms; 4 patches on the right side of the chest; 5 scattered areas on the abdomen between the umbilicus and pubes; nearly 60 groups distributed over the whole back; a few extensive patches on the extensor surfaces of both thighs and numerous areas in both groins. The head, neck, hands, legs and feet were all clear.

Patches which were only two days old were seen to consist of from four to seven, conical but flattened, firm, non-scaly papules, some arranged around, others between the hair follicles. Many of the lesions presented the appearance of a keratosis pilaris. The papules always appeared in the same way, gradually developing whitish, but not profuse, adherent scales, on removal of which a bleeding surface was exposed. The patches were gradually increased in size by the addition of new papules around the periphery while the older central lesion gradually flattened but remained scaly. The lesions then assumed a circular or oval-shaped aspect with a cleared-up center. The long axis of the patches in the lumbar region was transverse to the body. When two adjoining patches approached one another the intervening papules showed a tendency to gradually disappear, but over the region of the right scapula there was a large irregular area of papules which was made up of 10 groups, none of which had cleared up in the center. A whitish collarette extended up the hairs in many of the papules in the lumbar region. No vesicles or pustules were observed clinically during the course of the disease. A few solitary papules could be detected scattered over the back. All varieties of the lesions are well shown in the photograph (Fig. I) especially if a hand magnifier be used. There were no subjective symptoms.

A probable diagnosis of lichen scrofulosorum was made at first which was confirmed by the extension of the lesions, their uniform character and the appearance of a typical phlyctenular conjunctivitis. Numerous enlarged lymphatic glands were also present but as they occur often in healthy negroes, this symptom was not regarded as important.

The patient is the fifth of eight children (five girls and three boys), all living and in good health with the exception of one girl who died of "consumption." The father and mother are living and in good health. There is no tuberculosis in any form in the family now living.

Under the internal administration of hypophosphites and cod liver oil the cutaneous and eye troubles both rapidly disappeared. The sections all presented two striking features: (1) semiglobular-looking masses situated in the horny layer and in the majority of instances around the hair follicles, and (2) marked pathological changes in the upper portion of the corium beneath these papular masses and also around the hair follicles, especially the deepest portion. The latter was characterized by its tubercular structure. One could follow in the sections the formation of these clinical papules. Fig. II explains their genesis. The blood-vessels in the upper portion of the corium and papillæ were dilated and many polynuclear leucocytes had wandered out into the tissue and into the epidermis up to the horny layer where these cells became disintegrated; numerous lymphoid cells were found in the same situation, undergoing the same processes. Thus a mass of detritus and an apparent firm ground substance is deposited in the horny layer. This ground substance takes up the eosin stain very readily while the cells take up the hæmatoxylin. There are also a few degenerated epithelial cells in the mass of detritus. The stratum lucidum and stratum granulosum have disappeared. No apparent fluid exudation accompanies this emigration of cells through the rete, and the epidermal cells are but little swollen, nor are the interepithelial spaces much widened. Large numbers of pigment granules are also scattered throughout the papular lesion.

In Fig. III is represented a section of the whole patch excised showing three papules, (*P*) all of which are well marked. One shows its relation to a hair follicle (*P*); from the second it is evident that the section has just passed outside of the follicular opening as evidenced by the presence of the lower portion of the follicle (*H*); while the connection of the third with a hair follicle is seen in another section. The more pronounced papules show that they are made up of the same materials which have already been described, with the exception that there is a larger amount of pigment in the lesions. Directly in contact with the hair (*H*) there is a well-marked hyperkeratosis encircled by the papular lesions. This hyperkeratosis extends nearly half way down to the hair follicle. The middle papule exhibits completely the nature of the lesion just outside of the hair; it consists of a firm substance imbedded in which are enormous numbers of degenerated polynuclear leucocytes, lymphoid cells, many epithelial cells and masses of pigment granules. The mucous layer beneath consists of two layers of cells through which are emigrating hundreds of wandering cells. There is some

widening of the interepithelial spaces, but no marked œdema. The corium, especially directly beneath the papules and around the hair follicles shows marked changes. In the first region there is a fairly well defined area consisting of the papillæ and upper portion of the corium, in which are massed large numbers of lymphoid cells, numerous polynuclear leucocytes and some plasma cells with dilated blood-vessels. (Fig. III, *C.*)

Around the hair follicles in the lower portion are masses of chiefly round mononuclear cells, some plasma cells and epithelioid cells and a few mast cells. In four sections typical tubercles were observed in this situation (Fig. III, *G*), with giant cells forming the center surrounded by numerous epithelioid cells and mononuclear round cells at the periphery. The hair follicles themselves are unaffected. The blood-vessels (V) throughout the corium are dilated, are surrounded by numerous mononuclear round cells, a few plasma cells and numbers of polynuclear leucocytes. Two unaffected sebaceous glands were seen in one of the sections. The sweat ducts and sweat glands were normal, although a duct was seen passing close to the lesion. The blood-vessels accompanying the sweat duct were dilated and surrounded by additional cells as were other vessels. No tubercle bacilli were found in any of the sections stained for this purpose.

Hebra first described the disease and named it lichen scrofulosorum to characterize its clinical features. He declared that it was always acccompanied by other symptoms of scrofula. The disease had been previously described as lichen simplex by Erasmus Wilson, and as lichen circumscriptus by Cazenave. Jacobi in 1891 drew attention to the tubercular nature of the lesions, which he thought to be a perifollicular tuberculosis of the skin. Although he demonstrated a single tubercle bacillus in one of his sections, an inoculation into guinea pigs gave negative results. Later (1896) he demonstrated the presence of tubercle bacilli in a typical case and obtained positive results in a rabbit. In 1892 Sack decided, after a careful histological examination, that the disease was a miliary tuberculosis of the skin, the nodules showing a central caseation, then giant cells, epithelioid cells and small round cells. He suggested "tuberculosis lichenoides cutis" as a more applicable title. Later observers have apparently demonstrated the tuberculous nature of the affection especially of the severer forms. Thus Jadassohn found in 19 cases 14 associated with tuberculosis, and only one case in which no such disease was present. He was of the opinion that the disease was non-bacillary, but that it was a disease of tuberculous persons. Of 16 cases treated with tuberculin 14 reacted typically, but although inoculations were made into guinea-pigs from nine of the cases, negative results followed. Kaposi believes that there is nothing to prove that lichen scrofulosorum is a manifestation of tuberculosis, although he asserts that tuberculosis is always present. In Tilbury Fox's six cases he noted the presence of tuberculous symptoms in the patients. Pellizarri succeeded in producing tuberculosis in a guinea-pig after the inoculation from one case.

Haushalter (1898) inoculated 4 guinea-pigs from 2 cases and they became infected with tuberculosis, one of the cases had an otitis media, the other a tuberculous lymph gland as well as enlargement of other cervical glands. Some German dermatologists, e. g. Kromayer, Kaposi and Lukasiewicz, are opposed to the tubercular origin of this disease on account of the absence of caseation, the mildness of the affection and the rapid recovery. Only a very few cases have been recorded in France, and in those examined histologically no tubercle bacilli were ever demonstrated, although the subjects were tuberculous. It was believed, therefore, by the French dermatologists, Hallopeau, Brocq and Bureau that the lesions of lichen scrofulosorum were not due to direct infection but rather to the toxin of tuberculosis. Hallopeau reported one case which was associated with lupus. The lichen eruption was scattered chiefly over the trunk, but one group of papules was situated directly around the lupus nodule which had a scar in the center. In Lefebre's case no bacilli were found in the sections, and the animal inoculation was negative. In both the cases recorded by Morris and Crocker tuberculous glands were present, but in Walker's case tuberculosis in any form was absent, neither was there any tuberculous history.

With reference to the American reports, only two cases have been exhibited at the meetings of Societies, and of these only clinical histories have been given. In all the cases recorded, the histological findings always show a likeness to those in tuberculosis, but in most instances after diligent search no bacilli have been found nor was the disease reproduced in guinea-pigs after inoculation. The inoculations, however, which have resulted successfully have demonstrated its tuberculous nature in those cases. My own case is a comparatively mild one and the presence of bacilli could not be demonstrated. Clinically it presents all the typical features of a lichen scrofulosorum as originally described by Hebra with the exception of the color, which would naturally differ in a negro's skin. Tilbury Fox called attention to the fact that instead of always appearing in groups, the papules may occur singly.

Sack in his descriptions and drawings shows that the papule is formed by the miliary tubercle being deposited directly beneath the epidermis and by some slight hyperkeratosis of the horny layer.

In my case the papules consist of distinct lesions involving the horny layer, and form, as it were, a dry pustule. It was neither clinically nor histologically a pustule, since it appeared to be made up of a homogeneous ground substance with masses of nuclear detritus and numerous pigment granules. There was no special hyperkeratosis. The tubercular nature of the disease was far from being pronounced histologically in the present case and the tubercles were situated around the lower portion of the hair follicle.

It is strange that a tubercular cutaneous eruption which yielded so readily to cod-liver oil should arise in a well-fed, healthy child with good hygienic surroundings and without previous history of tuberculosis. Clinically the case suggests the adoption of Hebra's title of lichen scrofulosorum or Unna's folliculitis scrofulosorum rather than tuberculosis follicularis. Since successful inoculations, however, have been made in at least three cases, then the latter title would be more correct.

FIG. I.—Photograph of a case of lichen scrofulosorum in a negro girl. The lesion can be best seen by using a hand magnifier as a small scaly papular eruption.

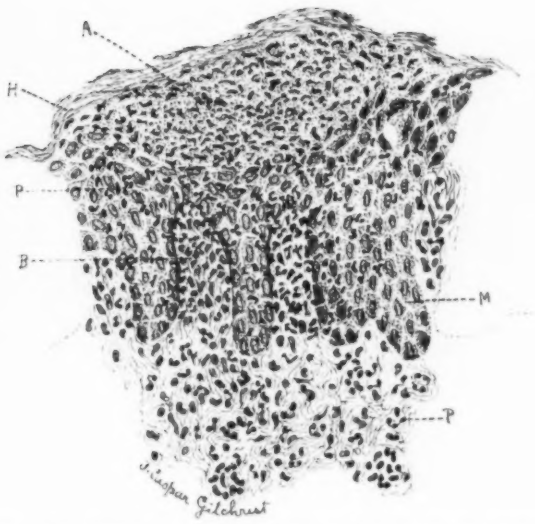

FIG. II.—Shows a commencing papule (*A*) which is formed between the horny layer (*H*) and the mucous layers (*M*). Numerous polynuclear leucocytes (*P*) and lymphoid cells are emigrating through the epidermis to the horny layer. Two papillæ (*B*) are filled with wandering cells and dilated vessels.

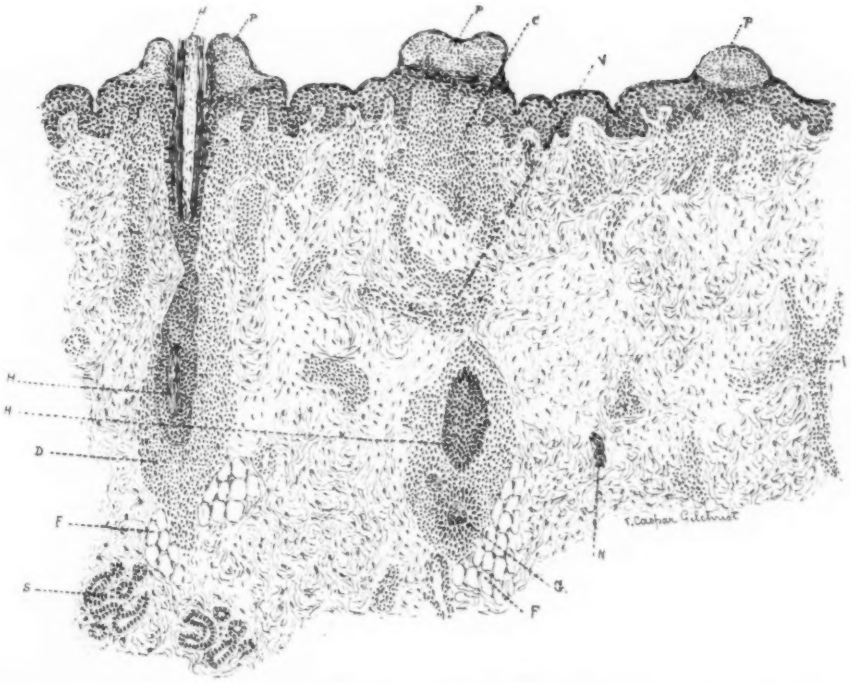

FIG. III.—Shows three well marked papules (*P, P, P*); one encircles a hair (*H*); in the other two the section has passed outside the follicular opening. *H, H*, are hair follicles; *C*, collections of lymphoid, plasma and connective-tissue cells and polynuclear leucocytes; *V, V*, dilated blood-vessels; *G*, is a tubercle near the lower portion of the hair follicle *H*; *F*, is fat; *S*, sweat glands; *D*, collection of cells around hair follicle.

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A NEW INSTRUMENT FOR MEASURING HETEROPHORIA AND THE COMBINING POWER OF THE EYES.*

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This evening I wish to describe a new instrument that I have recently devised for the estimation of certain functional disturbances in the extrinsic muscles of the eyes. The instrument is equally useful for testing both the heterophoria and the combining power of the eyes, but as one of its main features is that of a phorometer, I shall speak of it as a reflecting phorometer.

The instrument consists essentially of four mirrors, two for each eye, arranged one above the other and mounted in a rectangular frame so as to rotate on axes. The axes of the two upper mirrors are in the same line and are parallel to the horizon and perpendicular to the direction of sight. The axes of the lower mirrors are parallel to each other and lie in planes perpendicular to the horizon, and parallel to the direction of sight. The distance between the two lower axes is 6.25 cm. This distance may be greatly varied without having any material effect on the accuracy of the instrument, but the distance given was chosen as the most convenient one and closely approximates the average distance between the eyes.

The lower mirrors are made as large as possible without their interfering with one another. The upper mirrors are of the same size as the lower except perhaps a little longer. A good size for the lower mirrors is 3 cm. x 5.5 cm., and for the upper mirrors 4 cm. x 6 cm. In this model the axes of the upper mirrors are 5 cm. above the middle points of the axes of the lower mirrors, but this distance is unnecessarily great.

The axes of the lower mirrors are at an angle of 45 degrees to the perpendicular, but I think it would be better to reduce this angle as much as possible. The ideal way would be to have the axes perpendicular, but this is impossible since the lower mirrors would shut off the view from the upper ones. One of the upper mirrors is permanently set at an angle of 43 degrees to the perpendicular, while the other is freely movable about its axis, and to its outer end is attached a lever, 15 cm. in length, which is arranged to move along a scale and mark off the amount of rotation of the lever. Since the angle through which a mirror rotates is half the angular deflection produced in a ray striking it, the scale must be made so that one-half a degree of rotation of the mirror corresponds to one degree on the scale. The scale must be still further changed if it is desired to have it register prism-degrees.

To each of the lower mirrors a lever is firmly attached perpendicular to the axis at its middle point. These levers are each 8 cm. long, and at a point on each, 6½ cm. from the mirror, a small hole is drilled about the size of a cambric needle. Below this another, larger hole is drilled into which a key is fitted similar to those used on violins for tuning purposes. To a partition, placed midway between these levers, is attached another lever 14 cm. in length and pivoted at a point 3½ cm. directly behind a line joining the two levers and extending from the needle hole on one to the similar hole on the other. Three centimeters from the pivot of this middle lever a small hole is bored and a thread is then run through this hole by means of a needle and then continued through the holes of the other two levers. The thread is now connected with the keys on these levers and wound up until it is 3.1 cm. in length on each side. It must be firmly fastened

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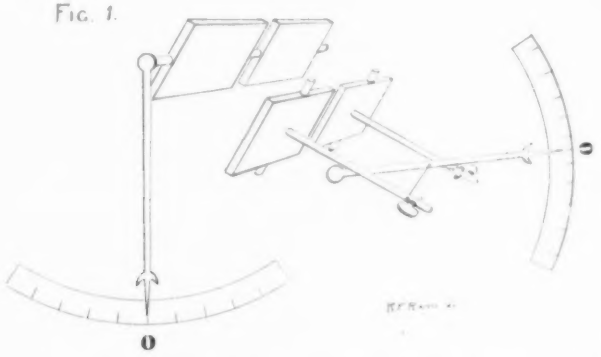
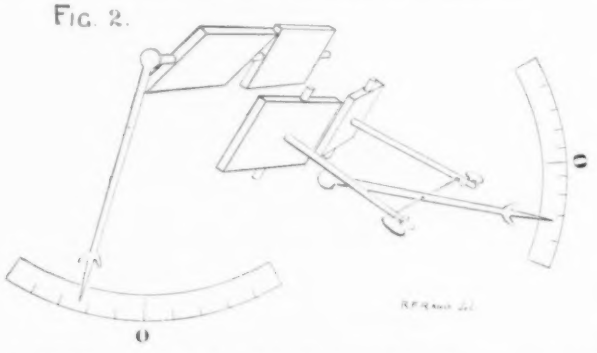
in the hole of the middle lever so that it will not slip. The thread is then made tense by means of rubber bands or helical springs attached to the levers and then to the sides of the frame. The object of the middle lever is to produce equal though opposite angular displacements in the two laterally moving levers.

FIG. 1.



A diagrammatic representation of the arrangement of the mirrors and levers is shown in Figs. 1 and 2. In Fig. 1, the two upper and the two lower mirrors are parallel and hence both scales register zero. In Fig. 2, one upper mirror is rotated to estimate hyperphoria or right sursumduction and the middle lever is depressed, tilting the two lower mirrors towards each other, to estimate exophoria or abduction.

FIG. 2.



A double level is fastened to the top of the instrument and the latter, resting upon a suitable stand (I have been using a camera tripod), is leveled and pointed at a small circular spot, distant twenty feet or more. To find the zero point for lateral displacement, one sights *over* one of the lower mirrors and then *through* this mirror and ascertains whether the image is in line with the object. If not, the middle lever should be moved up or down until this condition is obtained and then zero marked on the scale provided for the purpose. One must then sight over the other mirror in a similar manner, the adjustment being made this time however by the key attached to the lever of this mirror. A one-half degree prism is now held, base in, before one of the mirrors and the image as seen through both prism and mirror is put in line, by means of the middle lever, with the object as seen over them. One degree must now be marked upon the scale since there is a lateral displacement of one-half degree produced on each side. Similarly a scale of degrees for both esophoria and exophoria is obtained. To obtain the zero point for the upper mirrors, the middle lever is pulled down until both images can be seen with one eye and they are then placed on a level by means of the lever attached to one of the upper mirrors. Another method is to put the middle lever at zero and then view a horizontal line with one eye, moving the lever attached to the upper mirror until the line is apparently continuous. By the use of prisms an empirical scale may be obtained by this method.

After the zero point for the lateral displacement is once obtained, it is an easy matter to readjust the instrument if the threads should break or stretch. All that is necessary is to place the middle lever at the zero mark and then turn the keys attached to the levers of the lower mirrors until the object is in line with the images seen through the mirrors.

It is important both in graduating and in using the instrument to have the object at the same height as the instrument and also directly in front of the latter.

At the back of the instrument there is a door with two horizontal windows cut in it so as to correspond to the level of the eyes and their distance apart. On a pivot on the inside of the door is a shutter so arranged that when worked by means of a string it alternately closes one window and opens the other, one being always closed while the other is open. It would be very advantageous to have this shutter worked by some sort of clock-work arrangement.

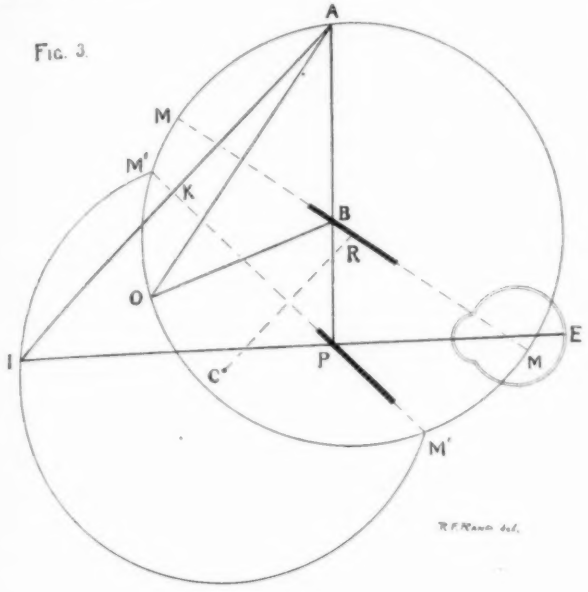
To use the instrument, the patient is directed to sit down behind it, place his eyes on a level with the windows, and look through them at the circular spot, which, as has been said, should be at a distance of about twenty feet. The levers are then placed at zero on both dials and the shutter is moved to and fro at a moderate rate of speed. The patient is now asked to state whether the object seems to move or not. If not, his muscle balance is perfect. If he sees the object apparently moving obliquely, the outside lever, that is the lever attached to the upper mirror, is moved until the patient says the movement is horizontal and then the middle lever is adjusted until there is practically no movement. The outside lever will then register the amount of hyperphoria while the middle lever registers the amount of exophoria or esophoria, according as it is below or above the zero point.

If now it is desired to measure the relative adduction, abduction, or sursumduction of the eyes, that is the combining power of the eyes, the door at the back of the instrument is opened and the patient directed to look through the mirrors with both eyes. He will then see the object single, and without effort, since his heterophoria has been corrected by the previous adjustments. The middle lever is now depressed until the patient, by the greatest effort that he can make, is just able to fuse the images. The dial will then register the number of degrees of abduction. Similarly the amount of adduction and of right and left sursumduction may be obtained.

In addition to the test with the shutter, the amount of heterophoria may be estimated by this instrument in a manner similar to that adopted when prisms are used. To do this all that is necessary is to produce vertical or lateral dip-

lopia by the levers, and then move the proper lever until the images are in line. It is well to use this test as a confirmation of the shutter test.

FIG. 3.



The diagram, Fig. 3, is intended to illustrate in as simple a manner as possible the construction involved in locating the position of the image for each eye. The relations of object and mirrors to each other are exaggerated in order that the construction lines may be more plainly seen. The mirrors are in their primary positions, so that a line drawn perpendicular to the axes of the upper and lower mirrors will be perpendicular to the plane of the lower mirror. *O* is the object, *M* and *M'* the mirrors. From *O*, a line *O A* is so drawn that it is perpendicular to and bisected by the prolongation of *M*. Similarly from *A* the line *A I* is drawn perpendicular to and bisected by the prolongation of *M'* at *K*. All the rays from *O* striking *M* will be reflected in lines directed from *A* and these rays will be reflected from *M'*, in lines directed from *I*. Therefore an eye directed towards the mirror *M'*, will see the image of *O* at *I*. The actual path taken by a ray of light from *O* is indicated by the line *O B P E*. The locus of *A*, as *M* is rotated on its axis, *R*, is evidently the circumference of a circle whose radius is *O R*. The locus of *I* during this rotation is the circumference of a circle with the same radius but whose center is at *C*, *R C* being drawn perpendicular to, and being bisected by, the prolongation of *M'*.

When *M'* is rotated on its axis, which lies in the plane of the construction, it is evident that *I* will move along the circumference of a circle perpendicular to the prolongation of *M'* and whose center is *K*. This circle being at an angle to the line of sight, *I* will apparently take an elliptical path.

From this it will be seen that when the middle lever is moved the image pertaining to each lower mirror moves in the circumference of a circle tilted at an angle of 45 degrees to the perpendicular and whose center is at the foot of the perpendicular drawn from the object to the axis of the mirror. Since the projection of a circle is an ellipse, the image of each mirror will apparently move in an elliptical course, and will thus not only move laterally, but also upwards to a slight extent. This, of course, would seriously interfere with the accuracy of the instrument if each lower mirror were rotated independently, but by the arrangement previously described, both mirrors are made to move equally though in opposite directions and hence the images when viewed with both eyes maintain their horizontality.

If the test object is a perpendicular line its image will generate the surface of a cone and thus when projected the two images, as they are carried apart, will make increasing angles with each other. In this way a certain amount of rotation of the eyes on their principal axes could be measured, and with this model about eight actual degrees of such rotation can be determined. This method is entirely distinct from that just to be described.

The rotation of the eye on its principal axis is spoken of as torsion. Where this rotation remains constant I would suggest that the term torsional strabismus or squint be used. Where the eye has simply a tendency to rotate, the term cyclophoria has been suggested. These conditions may be accurately determined by the following arrangement: Two equal circular disks each having two perpendicular lines drawn through its center are placed one above the other so that one of the perpendicular lines in the upper disk is continuous with one of the lines in the lower. The upper disk is so made as to rotate upon its center when desired and degrees should be marked off upon the background to which it is attached. The lower disk should have its semi-circumference plainly marked off in degrees. The instrument is then pointed at the two disks and the hyperphoria lever so manipulated that the images of the two are exactly superimposed. The patient's esophoria or exophoria should be corrected by prisms.

To measure the amount of torsion the eyes are capable of undergoing, that is, the torsional combining power of the eyes, the upper disk is rotated until the lower or upper lines are beginning to be seen double and the number of degrees read off. To test the torsional squint, the upper disk is rotated until only two lines are seen and the number of degrees read off. To test the cyclophoria it is best to rotate the upper disk a definite number of degrees and then have the patient read off the number on the lower disk as he sees it, the difference between the patient's reading and the number of degrees the upper disk has been rotated will be the number of degrees of cyclophoria.

From a few experiments made upon myself and others, I am inclined to believe that normal eyes have little or no torsional combining power. In the few cases I have examined I have not found the slightest evidence of cyclophoria in the otherwise normal eye. Considering the disinclination of the normal eye to undergo torsion, it seems to me that if cyclophoria were present to any extent it would soon lead to torsional squint and produce amblyopia in one of the eyes.

A certain amount of angular displacement of the *vertical* lines may be produced without diplopia resulting, but this is

not overcome by rotation of the eye, however, as diplopia is almost immediately produced by the equal angular displacement of the *horizontal* lines. The phenomenon must be due, I think, to a psychical compensation, if I may be permitted to use such an expression.

The reason this psychical compensation is so much greater for the perpendicular lines than for the horizontal is due, I think, to the fact that in viewing perspectives, the eyes have a stimulus to fuse non-corresponding points that are displaced laterally, while there is no call upon them to fuse perpendicular displacements, the eyes being always upon the same plane with regard to each other.

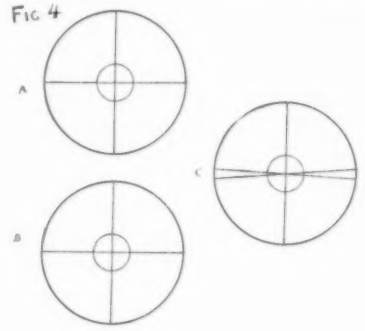
In this connection I quote the following from G. T. Stevens*: "It is an interesting as well as an important practical fact, and one to which little attention has been given, that horizontal lines cannot be held in union while being rotated from the horizontal direction to an extent nearly equal to that in which vertical lines can be held in union. If vertical lines can be held in union with a rotation of 20 degrees or more, horizontal lines become double with a total rotation for both tubes of from 6 to 8 degrees. Indeed, it requires some practice to hold the lines in union with a rotation of each tube either out or in to the extent of 3 degrees."

Stevens made his observations by means of an instrument which he calls the Clinoscope. This instrument enables him to superimpose various figures. The observation just quoted was made by superimposing two straight lines only. Stevens believes the phenomenon is due to differences in torsion, for he says: "A very considerable latitude is permitted in respect to the position of the vertical lines and the torsional act may overcome an important normal deviation." My experiments, however, lead me to believe that what Stevens has been studying is not the amount of torsion, but the variations in the psychical compensation for the different meridians of the eye. I have found that the greatest angle of separation of the lines at which they may still be fused, depends to a certain extent upon their length or what is just the same thing, upon the distance at which they are observed; the greater the distance, the greater the angular displacement allowed. This could not be the case if the phenomenon were due to torsion. On the other hand, if due to a psychical compensation for non-corresponding points, the increase in the angle with the increase in the distance would be expected, since the extremities of the lines would have to be placed farther apart in order for the extremities of their retinal images to be the same distance apart as before the increase in distance.

Another observation that I have made seems to prove conclusively that it is not by undergoing torsion that the eyes combine lines which are placed at an angle to each other. This observation was made by having the upper part of the vertical line on one disk separate from its lower part so that it could be put at an angle to the latter. If the upper part is rotated it will be seen that the line is no longer continuous, but consists of two radii of the disk placed at an angle. This line is readily fused with the vertical line on the other disk even when its two parts are at an angle of more than 10 degrees. It is inconceivable that such a line could be combined with a straight line by a process of torsion, since at least one of the eyes would have to rotate in two opposite directions at one time, but the assumption of the existence of a psychical compensation explains the phenomenon here just as satisfactorily as when both verticals are straight lines.

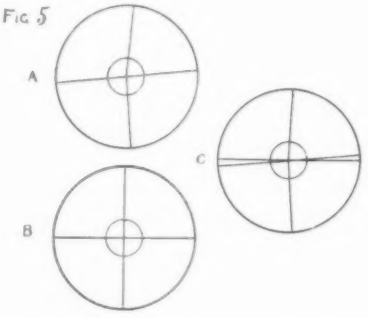
* Archives of Ophthalmology, Vol. XXVI, pg. 201.

Fig. 4



In Fig. 4 the upper disk, *A*, has been rotated 8 degrees, while the lower disk, *B*, is in the primary position. *C* represents the appearance presented to the eyes when *A* and *B* are superimposed. In Fig 5 the upper and lower parts of the vertical on *A* have each been placed at an angle of 5 degrees to the perpendicular, and are thus at an angle of 10 degrees to each other. The horizontal line remains perpendicular to the lower part of the vertical line and hence has been rotated 5 degrees. *C* shows the appearance when *A* and *B* are superimposed. It will be noticed that the angle between the two parts of the displaced vertical line on *C*, is less than the corresponding angle on *A*.

Fig. 5



In the proper use of the reflecting phorometer the shape of the object to be viewed is of very great importance. As mentioned above, when the images are displaced laterally they are also inclined towards or away from each other and consequently it would be impossible to combine them if the object were a line, unless the eye underwent torsion. This, I find, it refuses to do, and it is necessary to adopt a plan to overcome the difficulty. Practically I have found that the images of a small circular spot about 3½ cm. in diameter are readily combined. As a matter of fact, the images of the round spot when lateral separation is produced are converted into ellipses whose axes are inclined to one another, just as in the case of the straight line, but there does not seem to be

enough difference in the images to interfere with perfect fusion. Theoretically a sphere should be employed as the object, for no matter how rotated its projection would be a circle. If used, however, it must be evenly illuminated, otherwise the shading would defeat the purpose in view. Lighted candles, of course, cannot be employed. The best arrangement is, either a small white circular spot on a black background of good size, or a lamp with a round window.

The number of degrees the hyperphoria lever moves is almost exactly half the number of degrees of the vertical displacement of the images. It is not exactly half, however, because the circumference which measures the angle made by the moving image, has for a center a point a little in front of the eye. (Fig. 3, *C*). But at a distance of 20 feet this error is not appreciable, and even if it were the dial could be graduated empirically. The closer the mirrors are together and the nearer the eye is held to them the less is the error. For the near point, however, the error becomes considerable, and if it is desired to test hyperphoria for the near point a special scale is necessary.

In a theoretically more perfect instrument, it would be necessary to have both the lateral and vertical movements produced by the lower mirrors. This would entail, however, a more complicated mechanism, and I think it is hardly demanded. In this model only one of the upper mirrors is moved. It would be better, however, to have them so arranged that they would move equally but in opposite directions. This is so, because if the lower mirrors be tilted for a high degree of lateral displacement, the moving of one upper mirror would produce a movement of the image along an oblique line instead of a vertical one and hence diminish or increase the reading. This error is very slight, however, and diminishes directly with the amount of lateral displacement.

The center of the curve along which the lateral movement of each image is made, is, for practical purposes, at the intersection of the line of sight with the axis of the lower mirror. Since the eye is a short distance behind this point, the lateral movement for near objects is perceptibly less than that registered by the instrument. It is thus necessary to make a scale for the near point and on this model I have done so, taking as the near point an object whose image is 30 cm. from the eye. The method of obtaining the scale must be modified from that adopted for the 20 ft. scale, since the image is about as far back of the real object as the distance between the upper and lower mirrors. The difficulty is overcome by having an upright line at this distance behind the object and in making the scale the image is adjusted with regard to this line and not with regard to the object.

The range of this model is from 10 degrees of exophoria to 15 degrees of esophoria. If additional range is required all that is necessary is to add prisms to the cells at the back provided for the purpose. Thus if a 5-degree prism, base out, were added before each eye, the range obtained would be from 0 degrees to 25 degrees esophoria, and if base in, from 5 degrees esophoria to 20 degrees exophoria.

There may be some objections raised to the use of the thread in this instrument. I must admit that it does seem rather reckless to have the accuracy of the instrument hang by a thread, as it were, but the little likelihood of the thread being broken and the ease with which a new thread can be inserted and the instrument readjusted, I think fully warrant its use. Other mechanisms could be devised for the purpose, but I think they would not increase the accuracy of the instrument to any extent.

The advantages of the instrument are obvious. Even without the use of the shutter mechanism it has the same advantage that Stevens' phorometer has over the ordinary prism test. This lies in the evenness and rapidity with which the reading may be obtained. In Stevens' phorometer, it is necessary to separate the images primarily at a distance equal to the limit of the instrument, that is about 10 degrees, and they are farthest apart when the heterophoria is least, and therefore most difficult to estimate. I think this is a decided disadvantage, for one image is on the fovea while the other is on a less sensitive portion of the retina, and it is consequently not only more difficult for the patient to estimate their relative positions, but he is likely to overlook or suppress one image entirely. In the reflecting phorometer, on the other hand, the images need be separated only so far as to produce constant diplopia.

Moreover, such difficulties are entirely overcome by the use of the shutter previously described. By means of this it is possible to locate the images upon corresponding points, in fact upon the foveas of both eyes. The very slightest heterophoria is thus detected at once, the image apparently moving in one direction or another, and when the apparent movement is overcome by moving the levers, not only the esophoria or exophoria is indicated on the scale, but the amount of hyperphoria as well. I have not tested the instrument with cases of amblyopia, but it is extremely likely that it will prove of the greatest value in just such cases, since the patient is seeing with only one eye at a time and hence has little tendency to suppress either image.

In testing the strength, or really the combining power, of the eye muscles, the instrument has very decided advantages. Ordinarily in testing the combining power of the muscles, first one prism and then another is placed before the patient's eyes until a strength is reached which the patient cannot overcome and diplopia is produced. The objection to this method is that the patient is tired out by having to overcome prisms so many successive times, and one can never be sure that he is not suppressing one image. With this instrument, however, separation of the images is gradually, though quickly, produced by the proper lever, and when the patient says the images are slipping apart the result is read off on the scale. This occupies no more time that it takes to read it.

Another very important use to which the instrument can be put is to give gymnastic exercise to the eye muscles. By moving the lever, the patient himself can do this, not by jerks as with prisms, but smoothly, and I find that it is possible for the eye muscles to abduct, adduct, or sursumduct to a greater extent than with prisms and that it is not so fatiguing to the eyes. By the use of this instrument I have no doubt that exercise of the muscles of the eyes will produce more satisfactory results than have hitherto been generally claimed for it.

I wish to express my great obligations to Mr. R. F. Rand for the very careful drawings he has made for me, and to Dr. James Bordley, Jr., for looking over the literature. So far as he has gone, Dr. Bordley has found no mention of any instrument at all similar to this one.

During a discussion following the reading of the above paper before the Maryland Ophthalmological and Otological Society, my attention was called by Dr. Hiram Woods to an article by Dr. Alexander Duane in the New York Medical Journal for August 3rd, 1889. In this article Dr. Duane describes a test for the insufficiencies of the ocular muscles that he calls the parallax test. The principle of this test, I find, is undoubtedly the same as that involved in the shutter test as described by me. "It consists of shifting the screen from one eye to the other and making the patient observe if the image moves, and if so, in what direction." Dr. Duane measures the amount of insufficiency by determining the prism required to overcome the movement in any one direction, and he claims that the test is an extremely delicate one, especially for hyperphoria. Dr. Duane evidently shifted the screen by hand, and it seems to me that if he obtained such excellent results in this rough way, the test, used in connection with the reflecting phorometer in the way I have described, should prove of still more value.

I have given personal instructions regarding points necessary to the manufacture of the instruments to E. B. Meyrowitz, of New York, from whom in future they can be obtained.

DISCUSSION.

DR. THEOBALD.—I think Mr. Verhoeff has devised an instrument that is going to be of distinct value and one having decided practical merits. The shutter device, so far as I know, is entirely novel and very ingenious, and accomplishes exactly what is aimed at. The instrument combines with the qualities of the Stevens' phorometer the power to determine the ability of the muscles to fuse images; in other words, it gives the strength of the muscles in overcoming diplopia. At the same time it is simple and not likely to get out of order. I at first made the criticism that if one of its strings should be broken it would be difficult to get the instrument gauged again, but Mr. Verhoeff promptly threw it out of gear and in a few moments had it rearranged, showing that objection was not well founded.

I congratula'e him upon having done such an excellent piece of work, and I think the oculists will consider it an instrument of great practical value.

ON THE SOLUTION OF MERCURY IN THE BODY.

BY ARTHUR SMITH CHITTENDEN.

(*From the Pharmacological Laboratory of Johns Hopkins University.*)

The apparently ready absorption of metallic mercury and its subsequent elimination in a soluble form has led numerous investigators to inquire into the action of the body juices upon the apparently insoluble metal.

That inunctions of finely divided mercury or the inhalation of the vapor can give rise to marked symptoms of mercurial poisoning has long been a matter of common knowledge. That this fact involves somewhere and somehow a solution of the metal is obvious; and the determination of the place and nature of this solution has held the attention of many investigators.

For some time it was supposed that the blood exercised an oxidizing influence on the metal; and although this belief obtains substantially to-day among pharmacologists, yet the experiments which first led to this view have long been considered fallacious. For purposes of investigation the method of introducing mercury into the blood usually consisted in anointing either abraded or vesicated surfaces with quantities of mercurial ointment; animals were also compelled to inhale mercurial vapor. As a result of these experiments, soluble mercury was found in the blood, urine, and fæces, and apparently, also in the form of metallic globules, in the depth of the epithelium and in the dejecta.

Oberbeck* in a series of painstaking experiments found, upon making microscopic sections of the area treated with mercurial ointment, that the corium was infiltrated with minute globules of the metal. After a similar inunction of vesicated surfaces, Zuelzer* found the ducts of sebaceous glands as well as the sheaths of the hair follicles filled with the metallic globules.

In a paper some years previous to the foregoing, Hoffmann† obtained precisely opposite results in a series of similar experiments. It remained for Rindfleisch‡ to repeat these investigations and to determine the reason of the discrepancy in results.

After anointing an unabraded surface and cutting sections as described, he found that if he sectioned with the blade passing through the deeper tissues first and out through the skin, no globules of metal appeared in the corium and deeper structures; whereas, if he reversed the block and cut through the skin first, the mercury droplets could be made out in the depths of the tissue. In other words, the metal was carried into the tissues mechanically in sectioning.

In the experiments in which inunction on abraded surfaces was practiced and in which the insoluble metal was found in the internal organs, the lymphatic spaces and the capillaries were

* Oberbeck, Mercur. u. Syphilis. Berlin, 1861.

* Wein. Medicinal Halle, 1864.

† Hoffmann, Inaug. Diss. Würzburg, 1854.

‡ Rindfleisch, Arch. f. Dermat. u. Syph., 1870.

doubtless opened and the metal was picked up by the circulation.

The appearance of metallic globules in the fæces of dogs which have been anointed with mercurial ointment may also be explained by the fact that unless the ears alone be treated, it is almost impossible to prevent the animal from licking off and swallowing the mercury.

According to Hermann,* generally speaking, metallic mercury cannot as such pass through the intact epithelium in any part of the body. This is true of the respiratory epithelium as well as of any other. In cases where the mercurial vapor is inhaled, the metal is found condensed upon the surface of the epithelium, no globules passing beneath the surface unless they enter by some break in its continuity. Still other investigators, such as Hoffmann, Röhrig, Bärensprung, Neumann and Fleischer concur in this opinion.

If, then, in inhalation and inunction experiments insoluble mercury does not pass through the intact skin to be acted upon by the circulating fluids of the body, but does appear in soluble form in the blood and dejecta, what are the factors effecting solution? They may be found in two situations: in the secretions on the surface and in the menstruum of the ointment. That the secretions of the skin contain materials which will effect the solution of mercury has been sufficiently proven. Lewald has shown that by treating mercury with ammonium butyrate, a component of the secretion of the skin, solution follows; moreover, the sebaceous secretion contains various other agents capable of acting in this way.

When mercury is precipitated on the respiratory epithelium in inhalation experiments, Hermann† says that, aside from the oxidation processes which might be effected by the air in passing over these surfaces, we must suppose some supplementary oxidation as a result of the activities of the tissue juices. This is borne out by the researches of Rindfleisch‡ wherein he finds, after introducing blue ointment into the conjunctival sac and suturing the eyelids, that, although inflammation has occurred and pus has formed, subsequent section of the eye in glycerine fails to reveal any metallic globules.

The questionable methods of experimentation and the wide discrepancy in the results of investigation lead Schmiedeberg§ to cast serious doubt upon the power of the blood to oxidize mercury.

The possibility that the various investigators referred to may have unwittingly introduced soluble mercury and therefore obtained positive results is apparent, and it was with this contingency in mind that Fürbringer‖ devised a method calculated to eliminate experimental errors.

Having rubbed up definite amounts of mercury with gum arabic and glycerine, he obtained a dark-gray emulsion from which the larger globules separated out on standing; the remaining globules were exceedingly fine and remained in suspension. In the supernatant liquid Fürbringer found only very minute amounts of mercury; this emulsion he injected into the femoral veins of dogs. After a definite time, varying from twelve hours to seven days, he drew off and immediately defibrinated the blood. Having allowed the blood to stand until the corpuscles had settled to the bottom, the serum was decanted off and the organic matter destroyed by oxidation with HCl and $KClO_3$; the resulting solution was then submitted to electrolysis and positive evidence obtained in a number of experiments of the presence of soluble mercury.

In five experiments in which the animals were killed respectively, one, two, three, five and six days after injections, the chemical manipulations afforded plain evidence of the presence of mercury in the form of mercuric iodide rings. In four experiments no mercuric iodide whatever could be detected, and in three further instances the presence of mercury was questionable, as it could not be asserted positively that mercuric iodide was obtained.

Fürbringer's work is open to criticism in two particulars. In the first place, it is possible that a soluble compound is formed when mercury is rubbed in a mortar with solutions of gum arabic. Here, certainly, we have an exposure of finely divided mercury to oxygen, organic substances and to salts of potassium, calcium and magnesium. That it is possible for a soluble compound to be formed under these circumstances, Fürbringer admits; for, when his emulsions were allowed to stand for a long time in loosely stoppered vessels, a soluble mercurial compound, presumably mercurous mucate, was obtained. This possibility is further strengthened by the experiments of many investigators which show that when mercury is shaken with fluids containing salts and proteids a small amount of a soluble mercurial salt is formed.

A second criticism is that, oxidation of blood serum with HCl and $KClO_3$ will make soluble any metallic mercury which may be in suspension in the serum.

In justice to Fürbringer it must, however, be stated that he attempted by means of control experiments to show that he had not introduced soluble mercury into his animals and that the operation of defibrinating the blood and the subsequent chemical manipulations could not account for the mercury found in those of his experiments which yielded positive results.

Bearing in mind the criticism made upon previous investigations of this character, it is the object of this paper to present a method which shall, in so far as may be, eliminate questionable details of experimentation.

I have chosen the urine and fæces as the objects of investigation because they seemed to present the least possibilities of error; in so doing, the dangers of oxidation and contamination of the mercury by salts and fatty acids of the skin are avoided.

METHOD OF PREPARING AND INJECTING THE MERCURY.

An alcoholic solution of mercuric chloride was treated with stannous chloride until all the mercury was precipitated in a finely divided form; this was filtered and washed with hot water until the filtrate gave no precipitate with silver chloride. The residue on the filter paper was then suspended in a physi-

*Hermann, Toxikologie, Berlin, 1874. Also Harnack, Arzneimittellehre. Leipzig, 1883.
†Loc. cit. Also Harnack, loc. cit.
‡Loc. cit.
§Schmiedeberg, Arzneimittellehre, Leipzig, 1895.
‖Fürbringer, Virch. Arch., 1880, Bd. 62.

ological salt solution; when examined under the microscope this suspension showed the presence of globules of mercury which were smaller than a red-blood corpuscle.

Having dissected out the femoral artery and clamped it centrally, about 5 ccm. of this suspension, containing approximately 0.25 g. of metallic mercury, was injected peripherally into the artery of each of four dogs.

The needle was withdrawn and in each case the clamp removed and the wound closed by deep and subcutaneous sutures. By thus deeply burying the artery the possibility of hemorrhage or of the animal licking up mercury was obviated. The urine and fæces of these animals were collected for a period of six weeks after the injection and analyzed for mercury.

Method of Detecting the Mercury in the Urine and Fæces.

For the method of detecting and determining the mercury in the urine and fæces I am indebted to Winternitz* I constructed a system of three upright glass tubes each of which connected with a common T-tube and contained a roll of pure copper gauze 20 cm. in length. The urine was collected from time to time, filtered, acidulated to 1 per cent. with HCl and passed over the copper rolls through the uppermost arm of the T-tubes.

Each day's urine passed through this system six times and the collecting was continued for six weeks. The rolls of copper gauze were then withdrawn from the tubing, washed with water, alcohol and ether and submitted to a high temperature in the combustion furnace for one hour.

In glowing the copper rolls, a bayonet tube was used which contained beyond the rolls of gauze a layer of copper oxide and a spiral of silver wire separated by suitable asbestos plugs. In the straight end of the tube which projected from the furnace a small bulb was blown and in this were placed leaves of gold foil.

During the heating a stream of dry carbon dioxide was passed continuously through the tube from the bayonet extremity; at the end of an hour a large number of minute globules of mercury could be clearly seen on the sides of the tube as it projected from the furnace and in the bulb; also an amalgam had formed upon the gold foil. These globules could be rolled together into larger ones and gave red crystals of mercuric iodide when subjected to vapors of iodine.

To determine the mercury in the collected fæces, these were extracted for several days with water, the filtrate acidulated and passed over another series of copper rolls; the heating of the rolls was then carried out as in the urinary determination but failed to reveal any mercury in the form of visible globules. When, however, the tube and bulb were subjected to iodine vapor, plain evidence of a ring of mercuric iodide was obtained. The amount of soluble mercury present in the fæces was very minute as compared with that in the urine. This is hardly contrary to what might be expected, since secretion of mercury in the bile is slow† and the reabsorption in the intestine is rapid.* Furthermore, my method would not detect the mercury present in the fæces in the form of a sulphide. The total amount of mercury injected into the four animals was approximately one gramme; the amount recovered from the urine was estimated to be about 20 mg. That the amount recovered should be small is borne out by the researches of Lewin† who finds that after inunctions with blue ointment, mercury continues to appear in the urine for eight months.

The finely divided mercury used in these experiments was freshly prepared for each animal in order to eliminate any possibility of oxidation on standing.

That finely divided mercury could have been excreted as such by the epithelium of the urinary tubules would hardly seem probable inasmuch as repeated microscopical examination failed to reveal the presence of any globules either in the lumen or in the epithelial cells themselves.

Fürbringer speaks of the formation of thrombi during his experiments at the point where the cannula was introduced into the vein; other observers have mentioned emboli in the lungs. By injecting into the femoral artery it was sought to have the emboli form peripheral wards. Having killed one of the animals used in the experiments, I examined microscopic sections of the paw of the leg injected and failed to find any emboli. When Prof. W. H. Welch examined sections of the lymph glands which were submitted to him he made the following interesting observation: Scattered among the lymphoid cells were numerous large multinuclear megalokaryocytes, a condition resulting from parenchymatous‡ embolism of the bone marrow; these cells are subsequently expelled into the circulation from which they are filtered out by the lymphoid tissue.

The appearance of these cells in the lungs has also been observed in animals in which embolism of the bones had been produced.

Just how the solution of mercury by the body juices is effected and what part is played by the albuminous constituents, we cannot say, but that solution is effected and the mercury eliminated as an albuminate§ seems to be true.

Van der Does‖ finds that after shaking dilute egg albumen with finely-divided silver and then filtering, the filtrate is no longer coagulable by heat; the albumen thus treated will not decompose when exposed to air, and that silver has gone into solution. Albumen treated in this manner with mercury does not give a similar result.

* Winternitz, Arch. f. Exp. Path. u. Pharm., Bd. 25, p. 225.

† Lewin, Toxikologie II Auf., 1897, p. 116.

* Real encylopädie des gesammten Heilkunde, Bd. XVI, p. 317.

† Lewin, loc. cit.

‡ Lubarsch, Fortschr. d. Med., 1893, II, p. 805. Maximow, Virch. Arch., 1898, CLI., p. 297.

§ Real encylopädie der Gesammten Heilkunde, loc. cit.

‖ Hoppe-Seyler's Zeitschrift f. Physiol. Chemie, XXIV, p. 351.

THE JOHNS HOPKINS HOSPITAL BULLETIN.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS HOSPITAL MEDICAL SOCIETY.

Monday, January 9, 1899.

Exhibition of Medical Cases.—Dr. FUTCHER.

During the fall of 1898, Lancereaux, of Paris, published a new method of treating aneurisms. He published the first communication, in connection with Paulesco, about the 1st of October and the method is as follows:

He injects into the subcutaneous tissue of the thigh 250 cc. of a 2 per cent. solution of gelatin in normal salt solution. Of course, it is thoroughly sterilized and injections are made with aseptic precautions. The injections should always be made at a considerable distance from the aneurism, and he considers the most satisfactory place to be the subcutaneous tissue of the thigh. The interval between injections should be from two to fifteen days. He states that about 20 injections are necessary to produce a cure, and from a considerable series of cases in which he has adopted this treatment quite a large percentage are reported as cured. He finds, however, that ordinary diffuse dilatations of the arch of the aorta are not relieved by the treatment, but that the most satisfactory cases are the saccular dilatations of the aorta, or of any of the other vessels.

Huchard, also, used this method of treatment, but recommends that a weaker solution than the 2 per cent. be used. He found that after the injections were given a great deal of pain was complained of for several hours at the seat of injection, so he recommends the use of a 1 per cent. solution, which apparently causes no pain. He reported two cases in which death occurred; one was a case of pulmonary tuberculosis, in which he believed the hæmoptysis was due to minute aneurisms on the small vessels crossing the pulmonary excavations. This patient died rather suddenly during the treatment. The second case was one under the care of Dr. Barth, and, in this instance, the patient after the sixth injection had a sudden attack of dyspnœa, suffocation, and died in a few minutes. An autopsy showed definite clotting in the aneurismal sac; there was a layer of fibrin about 4 cm. thick all over the wall of the sac, but the clots had extended into all the vessels, excepting the left subclavian, springing from the arch of the aorta, completely occluding them, and causing sudden death.

The beneficial effect of the treatment is supposed to be due to increased coagulability of the blood. Intra-peritoneal injections have been made in the rabbit by Lancereaux, and he believed that the coagulability of the blood was always increased. However, the adoption of this mode of treatment of aneurism has led to a great deal of discussion before the Academy of Medicine, in Paris, and various observers claim that the coagulability of the blood is not increased. Laborde claims that it is not, and says that gelatin is not absorbed when injected into the peritoneal cavity, and that he has found the same amount of gelatin several hours after injection, as was originally given. He states that possibly eventually it may be absorbed, and if so, it is because it undergoes peptonization. Laborde recommends that the gelatin injections be made into the sac itself. Camus and Gley have performed experiments and found that there is no increase in the coagulability of the blood after intra-peritoneal injections of gelatin in rabbits—that is, there is no diminution in the time required for coagulation to take place.

We have now tried the treatment in four cases of aneurism in the medical wards of the Johns Hopkins Hospital.

The first was that of J. B., who was admitted about two months ago, with a definite saccular aneurism of the arch of the aorta about the junction of the transverse and descending portions of the arch, at least that is where we believed it to be during life. He had received six injections—two of the 2 per cent. solution, and four of the 1 per cent., because it was found that the first gave considerable pain. This pain was very intense and most severe about six hours after the injection. The patient appeared to be doing fairly well, when he was suddenly seized with an attack of dyspnœa, coughing and profuse hemorrhage, and died. At the autopsy there was found a general dilatation of the arch of the aorta with a localized saccular dilatation about the junction of the transverse and descending portion of the arch. At the point of pressure of the sac on the left bronchus there had been a perforation causing hemorrhage and death. There was no deposition of fibrin on the sac wall.

The second case in which the treatment was adopted was a patient, U. C., with aneurism of the descending portion of the thoracic aorta. He has now had 28 injections, more than the number supposed to be required to produce a cure. There was definite pulsation visible and palpable over the lower part of the thorax with a definite diastolic and systolic murmur in the back. There was intense pain at the seat of pulsation previous to the adoption of this treatment. Since the treatment was begun he has had very marked diminution in the amount of pain, and the pulsation is appreciably diminished. During the time of treatment he has gained 19 pounds in weight. It is the most satisfactory case we have had, so far, out of the four.

The third case is that of O. G., who has a saccular abdominal aneurism. He has now had 16 injections, with little or no evident improvement. He still has a great deal of pain.

The fourth case, C. L., has had 21 injections for a rather diffuse dilatation of the arch of the aorta. In this case, and in that of U. C. and O. G., there has been a marked increase in the coagulability of the blood after each injection—that is, the time of coagulation was distinctly diminished. (Exhibiting cases.)

An interesting condition that has followed the injections in Case IV is the occurrence of localized tumors at the seat of infection in the abdominal wall. The injections were made here because we thought there might be less pain than that which followed injections in the thigh. The pain was not, however, much diminished. The day following the injection a nodule the size of a hickory-nut frequently developed, occasionally accompanied with an elevation of temperature. These nodules persist for eight or ten days and then gradually disappear.

In the second case the coagulation time averaged about three minutes for the first ten injections and afterwards became

much delayed, for a short period, requiring 17 minutes for coagulation to take place. What the explanation of this is I cannot say, for it has again come down to five minutes.

THE SCHOTT TREATMENT OF HEART DISEASE.

About two years ago Dr. Camac read a paper before this society describing fully this method of treatment. Last summer I had the opportunity, through the courtesy of Dr. Theodore Schott, of seeing the method as used at Bad Nauheim. The treatment consists of two factors: the giving of thermal saline and carbon dioxide baths and the use of carefully regulated muscular exercises. The constituents of the saline bath consist largely of sodium and calcium chloride and the temperature is about 93 degrees F. After a series of these baths the patient is given a series of the carbon dioxide baths. The effect of the bath treatment is believed to be due to a stimulation of the peripheral circulation, thus increasing the amount of blood in the skin and subcutaneous tissue and in this way relieving the heart.

The exercises are believed to have practically the same effect; the patients usually get the baths in the morning and the exercises in the afternoon. The baths are given first for about six minutes and the time gradually increased until the patients are allowed to remain in the bath for about eighteen minutes.

I saw a patient given his first bath. It was a case of myocarditis in which the heart was very large, much dilated and its action extremely weak. Before putting him in the bath the area of cardiac dullness was carefully mapped out on a piece of transparent paper, and after the bath the cardiac dullness was again percussed out, the first diagram was placed over the second by means of definitely located points and any change in the area of cardiac dullness was thus noted. It was remarkable in this case to see the change; there was fully a finger's breadth difference in the extent of dullness before and after the bath.

At first the diminution after the bath is not permanent, but eventually a gradual gain is made and a widely dilated heart may diminish to practically its normal size.

Efforts have been made to devise a means of giving these Schott baths in hospitals and other institutions, and Theodore Schott has given formulas according to which the various baths can be prepared and carbon dioxide generated. The usual method of preparing the latter has been to use hydrochloric acid and sodium bicarbonate. During the past year a firm in New York known as The Triton Company have devised a means of dispensing with the use of hydrochloric acid and recommend a simpler way of generating the gas. They have prepared boxes containing a package of sodium bicarbonate and cakes of sodium bi-sulphate, the gas being generated by the action of these two salts upon each other. In addition to the bicarbonate of soda five pounds of salt and varying quantities of calcium chloride should be first added to forty gallons of water in the bath. The sodium bicarbonate is then put into the water and the cakes of sodium bi-sulphate, of which there are eight, are placed about the patient as follows: Two beneath the shoulders, two at each side of the body, and two under the knees. In two or three minutes there is a rapid generation of the gas and the patient may then be placed in the bath, where he remains a variable time, according to the stage of the treatment.

This patient with myocarditis has received the treatment here. He has had no rheumatism; has not been a heavy smoker, but a rather hard drinker, and it was found on physical examination that he had a much dilated heart, the point of maximum impulse being in the sixth interspace 12 cm. from the mid-sternal line, just before the first saline bath was given. His heart's action was very weak, the pulse very feeble and many of the beats not recorded at the radial pulse. Dr. Hastings was kind enough to make these charts, on which the red lines indicate the area of relative cardiac dullness before the bath, and the dotted lines that after the bath. The greatest width of relative cardiac dullness before the first bath was 12 cm., and after the bath 9 cm. With each succeeding bath the area of dullness gradually diminished and this chart represents the present area of relative cardiac dullness, which you see is markedly diminished. The apex beat is now in the 5th interspace 7.5 cm. outside the median line and the greatest breadth of relative cardiac dullness is only 7 cm. His condition is much improved and he goes about the wards with very little dyspnœa.

Dr. WELCH.—Referring to the first cases, I should like to ask whether in the gelatin treatment for aneurism any attention has been paid to factors other than the coagulation time, particularly as to whether there is any increase in the number of platelets in the blood or any diminution in the red-blood corpuscles? I speak of this because the coagula in aneurism are not ordinary clots as they form outside of the body, but are genuine thrombi which consist in their inception of platelets, and it is difficult to bring the occurrence of these thrombi in the body into any definite relationship with the rapidity of coagulation of the blood. Many diseases like lobar pneumonia and acute rheumatism in which there is increased fibrin content are not so frequently associated with peripheral thrombi as are typhoid fever and certain anæmic and cachectic conditions in which the fibrin content is low. We cannot bring the appearance of coagulation in the living vessels into direct parallelism with the coagulability of the blood as ordinarily understood. There are indications suggesting a connection of these thrombi with the number of platelets in the blood. In chlorosis, for instance, the number of platelets is increased and peripheral thrombosis is a well-recognized complication, whereas in pernicious anæmia the number of platelets is diminished and thrombosis rarely, if ever, occurs. In hæmophilia there is sometimes total absence of platelets. There is much for the view that the number of platelets is an index of lowered resistance of red corpuscles. If, therefore, there is any evidence that the gelatin treatment favors the production of thrombi in aneurisms, it seems to me that some light may be thrown upon the explanation of this occurrence by the study not only of coagulation time and fibrin content, but also of the possible influence of the gelatine injections upon the resistance and number of the red copuscles and the number of platelets.

Aneurism of Aorta, Compressing and Rupturing Into Left Bronchus.—DR. FLEXNER.

Anatomical Diagnosis: Aneurism of the aorta, rupture into the left bronchus, hæmoptysis; aspiration of blood into the lungs; compression of left bronchus; slight bronchiectasis, and carnification of the lung; acute splenic tumor; slight chronic nephritis.

The pericardial sac does not contain an excess of fluid; both layers of the serous membrane are smooth. There projects into the summit of the sac a roundish tumor springing from the aorta, which is intimately united with the pulmonary artery. The heart was opened *in situ*. It was found that springing from the left lateral wall of the ascending portion of the aortic arch is a saccular aneurism projecting toward the left side. The projection into the pericardial sac is found to be due to an extension from this aneurism. The dilatation of the aorta begins 5½ cm. above the attachment of the aortic valves and, as will be seen, includes portions of the ascending, transverse and descending aorta. An opening which is approximately circular and measures 6½ cm. is situated on the left lateral side of the artery. This opening can be divided approximately into three segments; the first third springs from the ascending, the second from the transverse portion and the third, which is the shortest, from the descending portion of the arch. The depth of the sac is approximately 4 cm. The sac, as stated, extends to the left and pushes aside the upper lobe of the left lung to reach the pleural surface with which it is firmly united. Finally it comes to impinge on the left bronchus, and it has also grown together with the fibrous wall of this structure. The œsophagus also is pressed upon by that portion of the sac which has come to lie next it.

The entire main bronchus, from the bifurcation of the trachea to the first division in the hilus of the lung, is pressed upon by the sac of the aneurism. As a result the walls of the former are distinctly thinned and there is a marked lateral compression of the tube. The bronchus has been perforated just below bifurcation of the trachea at a point coinciding with the intercartilaginous tissue between the second and third rings. The mucous membrane covering the second ring is eroded, while that over the third is swollen and defective superficially. The membrane between the third and fourth rings is much attenuated and appears to be covered by nearly intact mucous membrane only. There are two small ruptures to be made out in this membrane, which might readily have been produced in the removal of the lungs and bronchi. The mucous membrane of the bronchus where it is freed from the recently coagulated blood which covers the surface is pale. The left lung is bound to the chest wall and to the pericardium and aneurism by old adhesions; the apex only is crepitant. The bronchi upon section show a moderate dilatation of the medium-sized tubes, while the lung substance is congested, dense and more or less airless, the consistence being increased. In this carnified and congested tissue there are scattered small whitish or grayish points, and from the surface a cloudy fluid can be expressed. Certain areas of the lungs present a grayish and slightly coal-pigmented aspect and are semi-translucent. The right lung is voluminous. There are moderate pleural adhesions, the anterior and superior half being bound to the pericardium. Where free from adhesions to the chest walls and pleura it shows blotches of hæmorrhage, and upon section there are present deep red areas corresponding to points of blood aspiration. The medium-sized bronchi are plugged with recent clots of blood. The trachea and larynx, except for the staining of mucosa, are free from coagula of blood.

The aorta is the seat of marked arterio-sclerosis with slight calcification. The sclerosis does not begin immediately above the valves in that it leaves the first part of the aorta clear for a distance of 5 cm.; the most marked sclerosis is in the transverse arch. The sclerosis is less marked again in the thoracic aorta and abdominal aorta where relatively few sclerotic patches occur. The sac of the aneurism is almost entirely free from clots; the coats of the artery are shown to be present everywhere, the inner coat presenting an irregular corrugated appearance. Fatty patches, a few elevated fibrous nodules and a number of calcified areas measuring several millimetres in diameter—these last showing a slaty pigmentation—occur in the sac of the aneurism. These slaty and calcified areas are, on section, found to agree with underlying and closely adherent, nearly black lymphatic glands. The coagula upon the wall consist merely of a recent granular deposit, not exceeding a millimetre in thickness and imperfectly covering the inner surface.

Bacteriological examination showed the lung, liver and kidneys to contain the bacillus lactis aerogenes. The lung and liver, spleen and kidneys gave the micrococcus lanceolatus. 0.3 cc. of a culture of the micrococcus injected into a mouse produced death from general septicæmia.

Miss Reed has kindly examined the sections from the case, the chief interest of which centres in the spleen and the left lung. The spleen shows in its substance, especially in the neighborhood of the capsule over the ventral surface, a number of hæmorrhages, some small and others larger, although the largest does not exceed 1 or 2 mm. in diameter. In a broad way two kinds of hæmorrhages may be distinguished, although the line of demarcation is not absolutely sharp. The larger ones consist of red-blood corpuscles chiefly, with probably a due proportion only, of white corpuscles; the smaller, infiltrating areas which may not certainly be hæmorrhages, but localized congested areas, show a less perfect preservation of the hæmoglobin and the number of leucocytes with irregular nuclei considerably increased. Among the leucocytes in these latter situations are cells, the protoplasm of which reacts in a manner peculiar to hæmoglobin, which contain single nuclei or nuclei undergoing fragmentation. Similar cells to these are found distributed throughout the pulp of the spleen and are probably relatively as numerous as in the congested or hæmorrhagic areas just mentioned. Sections stained by the Biondi-Heidenhain method seem to prove what those stained in methylene-blue and eosin indicated, that these cells are normoblasts. The contents of some of the larger branches of the splenic vein are red corpuscles, leucocytes, cells with spindle-shaped nuclei; the latter were not improbably endothelial cells, derived from the vessels, post mortem. Small thrombi consisting of platelets and of leucocytes are also found in dilated veins containing in addition red corpuscles and endothelial cells presumably desquamated. The mixture of leucocytes and

platelets form small islands within the lumen of the vessel. Capillary thrombi in the region of the small hæmorrhages were not discovered. In sections stained by Weigert's fibrin method this element occurs in foci in the splenic pulp. Finally, a fairly large number of cells containing red corpuscles are present in the pulp.

The description of the lung is limited to the left lung. The bronchi are moderately dilated and contain mucus, fragments of red corpuscles, and more or less modified desquamated cells. The blood-vessels in the wall are swollen and the wall is infiltrated throughout with round cells, some of which present exquisitely reticulated nuclei, placed somewhat eccentrically, and resembling plasma cells. This infiltration is not limited to the wall of the bronchus but involves the connective tissue which includes in the same sheath the vein and the artery. The artery shows a new growth of tissue in the intima, which is young and cellular and not annular, but is developed especially on the side of the vessel next the bronchus. The irregular distribution of the new tissue in the intima is shown in a section which includes a branch of the artery, for the new tissue is developed almost exclusively on the side of the vessel, next to the bronchus and is very little present in the point of origin of the new branches. In the lung the new growth of tissue is in the pleura—in the interlobular and perivascular tissues especially. The alveolar walls, it is true, do show an increase in the immediate neighborhood of the perivascular infiltration, but at distances from this there is only a filling up of the alveoli with desquamated epithelial cells, serum, a few leucocytes and a minimal amount of fibrin. The greatest amount of fibrin is in the immediate vicinity of the largest and most infiltrated bronchus. Not a few of the desquamated epithelial cells contain blood-pigment, or coal-pigment, or red-blood corpuscles. In sections stained in alkaline methylene-blue and eosin there were short chains of cocci to be made out. Thrombi are wanting in the vessels in this organ.

The type of liver cirrhosis is syphilitic. Sections through the coarse fibrous band in this organ showed a dense sclerotic tissue containing numerous islands of liver substance and a moderate number of newly formed bile ducts. Some blood-pigment and partial obliteration of the smaller-sized arteries through an annular growth of connective tissue in the intima are also present. Gummata as such are not present in any of the sections examined. The kidney showed a marked degree of parenchymatous degeneration and a small amount of new connective tissue. The heart muscle exhibited a marked degree of fragmentation and segmentation of the myocardium. The type of fragmentation is that regarded by Mr. MacCallum as being preceded by degeneration (sarcolytic) of the affected fibres.

Multiple Metastases from Pelvic Sarcoma.—[See BULLETIN for April, 1899.]

DR. FLEXNER.—The case reported by Drs. MacCallum and Harris is interesting from several standpoints. The distribution of the metastases exhibits two modes of dissemination of tumor cells: (1) Blood-vascular and (2) lymph-vascular. The nodules in the lungs undoubtedly owe their development to the first-mentioned mode. This is rendered probable not only by the relations of the primary and secondary tumors, but also from the fact that Dr. MacCallum succeeded in tracing the growth along the walls of the blood-vessels to the nodules situated especially in the pleura, and also found groups of tumor cells in blood-vessels in the lungs. The testicular growth is conceivably of blood-vascular origin, the tumor cells having passed through the lungs and gained access to the general circulation. I am, however, disposed to regard the invasion of the testes as having taken place through the lymphatics, from the pelvic growth, by means of retrograde transport—a phenomenon not so very infrequently met with under similar circumstances.

As Dr. Harris pointed out, the streptococcus in this instance was highly pathogenic, not only for human beings but also for mice, an observation that has interested us greatly, in that our experience has been that growths of streptococci from human autopsies do not usually exhibit striking pathogenicity for these small animals. The streptococcus infection in this case was doubtless an example of terminal infection. We have now encountered a number of instances of terminal bacterial infection in malignant tumors.

NOTES ON NEW BOOKS.

The American Year Book of Medicine and Surgery. Edited by GEORGE M. GOULD, M. D. (*W. B. Saunders, Philadelphia*, 1899.)

The standard of previous years has been kept up in this work. It contains 1032 pages of text and 70 pages of a complete index. In the preface Dr. Gould refers to the omission of the name of Dr. William Pepper from the list of contributors. His place has been taken by Dr. Stengel and Dr. Edsall. The editor draws attention to the increasing difficulty of the yearly task of selecting what articles shall be noted. In this connection the hope may again be expressed, that it might be possible to give the titles of the most important articles not referred to in the text. If space allowed this, it would be an addition to the value of the book. The extracts are well made and evidently combine a maximum of information in a minimum of space. Altogether Dr. Gould and his staff of editors are to be congratulated on the Year Book for 1898.

Annual and Analytical Cyclopædia of Practical Medicine. By CHARLES E. DE M. SAJOUS, M. D., and one hundred associate editors. Volume II. (*The F. A. Davis Co., Publishers, Philadelphia.*)

The second volume of this valuable cyclopædia covers the subjects from "Bromide of Ethyl to Diphtheria." It contains 607 pages of useful reading matter. The object of the editor has been not only to facilitate the labor of the practicing physician and to assist investigators and authors in their researches, but also to render clear, through contributions from men possessing special knowledge or unusual experience in a particular line, diseases which, owing to their complexity, are not generally understood. The high standard of work commenced in the first volume is here maintained. The second volume contains among others, excellent articles on "Cerebral Hemorrhage," by Dr. William Browning; "Cirrhosis of the Liver," by Professor Adami; "Cholera," by Professor Rubino; "Cholelithiasis," by Professor Graham; "Diabetes," by Professor Lépine; and "Diphtheria," by Drs. Northrup and Bovaird. The editor states in the preface, in reply to numerous inquiries, that he himself wrote the unsigned article on "Animal Extracts," which appeared in the first volume.

Manual of Physiology, with Practical Exercises. Third Edition. By G. N. STEWART, Ph. D., Professor Physiology, Western Reserve University. (*Philadelphia: W. B. Saunders*, 1898.)

The rapid appearance of successive editions of this conveniently sized manual is sufficient evidence of a continued demand among medical students for text-books of smaller compass than the well-known standard works.

The present author, unwilling to meet this demand with a more or less elementary account of the subject, succeeds in crowding into his books all its details and gains the desired reduction in size by conciseness and brevity of treatment. The book is accordingly replete with facts, and extremely suggestive to one who possesses a previous knowledge of the subject. But as the high degree of condensation is necessarily attended with a corresponding loss in clearness and intelligibility, it is at least questionable whether it is really suited to the needs of medical students.

The practical exercises which, at first glance, enhance the value of the book, occupy about one hundred pages out of a total of somewhat over eight hundred. But the conviction grows on one that the author might have utilized this space more profitably to the reader as well as himself, if it had been expended upon a fuller and more lucid exposition of the general text. The frequent cross references from text to exercises in itself seems an acknowledgment on the part of the author of the insufficiency of the former. After all, the exercises claim no special merit as far as the choice of experiments is concerned; quite a number of excellent laboratory manuals, such as Stirling's or Brodie's, amply provide for the students' needs in this direction, while their grouping under the several chapters with reference to the systematic course, to which the author calls attention in the preface, will hardly be expected to secure a similar arrangement *in practice*. That the latter is advantageous and desirable for many reasons goes without saying, but its actual attainment depends on more things than the position of the exercises in a manual.

The book otherwise possesses many admirable features. We need only mention the superior character of all that pertains to its mechanical make-up, the number and variety of its illustrations, and the extent to which the most recent advances in physiology have been appropriated and used throughout the volume. We are a little surprised to find in so crowded a book a long paragraph on the *Care of the teeth*, a sort of error in perspective which also crops out occasionally in passages in which a relatively unimportant point is spread over a number of pages, out of all proportion to its value and significance. The discussion of the "Rate of blood-flow" covers about nine pages while the "origin of urea" is disposed of in three pages. In the chapter on nutrition we also note the omission of Drechsel's theory of the formation of urea and the scanty treatment given to the inorganic compounds, some of which like Ca have lately acquired so much significance in the general economy of the body. A few minor errors, like the formula for uric acid on page 436, the reference to Fig. 143 on page 519, and the incorrect account of the Holmholtz arrangement of the induction coil should have been corrected in a revised edition.

G. P. D.

The Peritoneum. By BYRON ROBINSON, B. S., M. D. Part I: Histology and Physiology. 4°. Number of pages 405 (not including a bibliography of 103 pages). 247 illustrations. (*Chicago: The W. T. Keener Co.*, 1897.)

This volume is the first of what the author evidently intends to be a series of books dealing completely with the subject of the peritoneum. He tells us that it "is the outcome of a half dozen years of personal labor in experiments in the peritoneum, in the study of its anatomy and in microscopical research. The labors of others have been consulted and credited." Indeed, so ready is the author to give credit to those who have aided him, he has often, we fear, ascribed to other investigators much that they would not claim as their own.

Dr. Robinson has been anxious to follow the example of the illustrious John Hunter, by distinguishing himself in scientific studies of value to medicine. He has put his whole soul into the work. It is dedicated to his wife and professional associate, Dr. Lucy Waite. Each chapter is headed by quotations from general literature which have appealed to the author as particularly fit. Wordsworth and Dryden, Gibbon and Froude, Lord Bacon and Emerson have all served to inspire the author in his work. The chapter on the blood-vessels, for instance, is headed by a quotation from Tennyson's Brook:

"Men may come and men may go, but I go on forever."

On the title-page the following is quoted from Schiller:

"To contro a subject, to be its master, to concentrate upon it all that is absolutely necessary, demands, in truth, the powers of a giant, and is more difficult than one would think."

Eager to discover the secrets of the structure of the peritoneum, Dr. Robinson has been led into attempting the mastery of many subjects necessary for this work, histology, histological technique, physiology, pathology, comparative anatomy and the history of medicine. The result has been most remarkable, as the extracts given below will show.

The book is divided into chapters. "Owing to an attempt to make each chapter as complete as possible," says the author in the preface, "repetitions have been to a certain extent unavoidable." Indeed, the author has been so desirous of expressing in every paragraph and sentence the totality of his knowledge of the subject, that repetition might be found on every page were Dr. Robinson capable of expressing his ideas so accurately that they would appear to be quite the same when they are the second time transcribed. The titles are the only clues as to the specific nature of the various chapters.

The absolute disregard of logical order displayed by the author is the most remarkable thing about the book. This is indicated in the extracts quoted, but to be fully enjoyed must be sought in the original.

"Diligence and accuracy are the only merits which an historical writer may ascribe to himself."—Gibbon, heads the historical sketch with which the book opens. In the first paragraph the time of Erasistratus is given as from 340-280 B. C.; in the second paragraph that of Galen is given as 131-201 to 210 A. D. Then the author goes on to say, "Galen must have been in the possession of the writings of Erasistratus, for he noted the fact in regard to the lacteals of kids 150 years after the death of Erasistratus." Further on in the book the following account is given of the origin of the cell doctrine and of its application to the study of the peritoneum. It will not seem strange to state that the organ known as the peritoneum is composed of simple cells, when one recognizes the penetrating power of the microscope and the vigorous and far-reaching investigations of the nineteenth century" (p. 26). After a considerable discussion of the work on the cell of Schleiden, Schwann, Muller and Johannes Miller, to each of the last two of whom is given in different parts of the same paragraph the credit of popularizing Schwann's works (Johannes Mueller is evidently meant), the author goes on to say: "At this period of the world appeared the immortal Bichat, whom the French claim founded histology, by employing the discoveries of Schleiden in the plant cells and those of Schwann in the animal cells" (p. 26). It will, perhaps, be remembered that Bichat died in 1802, two years before the birth of Schleiden, and eight years before the birth of Schwann.

What has confused the historian is the fact that Bichat called the peritoneum a "cellular membrane," meaning, thereby, one containing areolar connective tissue, which, at his time, was commonly called cellular tissue. For any understanding of our modern cell concepts, the use of the microscope is necessary.

Bichat, owing to the imperfections which existed in the instrument while he lived, put little faith in the value of the microscope as a means of tissue study. Considering the work done of recent years in cytology, it is not uninteresting to read the concluding remarks of Dr. Robinson on this subject: "Finally, the last break in traditional thought was made by the celebrated Brecke, who stated that a nucleus was not necessary to any cell. We now have the final definition of a cell—that is, a mass of protoplasm" (p. 27). Brücke is here probably referred to. Brücke is celebrated for having been the first to suggest definitely ('61) the modern conception of ultra-cellular units ranking between the molecule and the cell.

"The peritoneal membrane," he tells us, "is not dissimilar to the skin, being of about equal area" (p. 14). In the discussion of the various elements composing the peritoneum, he tells us "Perhaps the most typical specimen to observe a connective tissue corpuscle is in the blood-vessel wall of the broad ligament of a gestating turtle." Among elements not before described, is the "elastic tissue cell." "The elastic cell is what gives to the peritoneum its peculiar quality of adaptation to environments. The elastic cell must belong to a certain extent to the endothelia, for which they are capable of extension and contraction to a wide degree. The elastic fibre, composed, of course, of cells, is produced, according to Ranvier, by fusion of small globules. The elastic cell is very abundant; it is associated with the genital organs and endows them with the wonderful power of changing their conditions and of returning to normal without loss of integrity" (p. 31-32).

Here we have a most curious example of the confusion of ideas of form and function, so characteristic of the author. He has evidently fused an idea of the elasticity of the endothelial cells, and an idea of the existence in the peritoneum of elastic fibres into the vague conception of elastic cells.

We have not space at our disposal to quote here at greater length the author's original descriptions of his anatomical findings.

As to the physiology, "especially will we be surprised to know that the peritoneum of the dead animal will absorb, for many hours after death, exactly similar to that of the living" (p. 35). "The physiology of the peritoneum must be looked for in the inter-endothelial space by its dilatation and contraction. The cover-plates are, perhaps, not *engaged much in physiology* (sic). The hard, indurated metamorphized protoplasm of the cover-plate aids chiefly in a mechanical way to facilitate motion, when aided by the visceral fluid secreted through the inter-endothelial space. However, the cover-plate doubtless plays a rôle in osmosis. "The forces which are said to induce peritoneal absorption of fluids may be enumerated as follows: (*a*) Vital cell forces; (*b*) stomata; (*c*) imbibition; (*d*) filtration; (*e*) intra-abdominal mechanical pressure; (*f*) osmosis" (p. 394). "Through ages of evolutionary processes of infective invasion, the pelvic, appendicular and gall-bladder region (the region of the large intestine) has acquired a physiology which resists the infectious germs in the common regions of peritonitis" (p. 399).

Although the object of the present volume is to deal mainly with the normal histology and physiology of the peritoneum, the author does not hesitate to refer to his extensive clinical and pathological experience when this may aid in making clear his thought. "The peritoneal surface is equal in area to the skin, and when injured by traumatic processes or attacked by disease, shows similar effects, as profound shock, significant vascular disturbances and depressions. A square foot of peritoneum being inflamed shows similar disturbances as the inflammation of a square foot of skin. In the peritoneum the inflammation is not so apt to be circumscribed or limited as it is in the skin, and hence the more danger of sepsis. Sepsis may pass through the peritoneum and leave it, as a bullet leaves a gun-barrel, uninjured" (pp. 256-257). "When foreign bodies (microbes or colored granules) enter the peritoneum the leucocytes swarm out (*a*) to digest the invader, (*b*) to surround or imprison the microbe or (*c*) to sterilize the germ" (p. 289).

Of equal value are the author's researches in the comparative anatomy of the peritoneum. "In this work we have examined the peritoneum of man, horse, dog, sheep, cat, cow, pig, hen, woodpecker, shypoke, frog, turtle, rabbit, crawfish, dove, guinea-pig, rat, fish, and embryos of man and some other animals. The material has been ample, but it would have been desirable to examine the peritoneum of monkeys and other animals only obtainable by living in proximity to a menagerie, where one could examine systematically the various genera and species and note the differences. However, material has been sufficient to induce me to believe that the peritoneum of vertebrates is constructed so much alike that it is equally well to select two animals, as the rabbit and the frog (cheap and conveniently obtainable), and carefully interpret the phenomena of structures and function of their peritoneum. The endothelia of the fish are like those of mammals. The crawfish has relatively small-sized endothelia, and they are very compact" (p. 34). "This work has proved that the structure of the peritoneum of vertebrates and mammals is quite similar" (p. 23). "The turtle (amphibia, *sic*) is one of the best animals to show vast interstitial subperitoneal spaces" (p. 395).

Many of the illustrations taken from the literature, especially those from Kolossow's articles, are well reproduced. The great number of the drawings, made by the author himself, serve to adorn the text. The bibliography is as complete a one as money can buy.

Taking the book as a whole, it reminds us more strongly of the remarkable Syllabus of Ephraim Cutter on Clinical Morphologies, than any other book that we have seen, though the latter has the additional merit of better order and of much greater condensation. It may be remembered that Cutter names among other things in a long list of objects to be looked for when examining the sputum, the "lumina of blood-vessels," and apologizes for not adding to the list the difficult "morphology of the air." B.

The American Pocket Medical Dictionary. Edited by W. A. Newman Dorland, A. M., M. D. Containing the Pronunciation and Definition of over 26,000 of the terms used in medicine and the kindred sciences, along with over 60 extensive tables. (*Philadelphia: W. B. Saunders*, 1898.)

This is a handy little volume that, upon examination, seems to fairly fulfill the promise of its title, and to contain a vast amount of information in a very small space. It must be, of necessity, incomplete; but it is somewhat surprising that it contains so many of the rarer terms used in medicine as it does.

The principal criticism suggested, and this seems a little ungracious when so much is given in so small a compass, is that it might well have contained a few more of the modern synonyms of the nervous system, proposed by Dr. Wilder, than we find in it. These terms have already been employed in medical literature and are likely to be employed again, and their inclusion would have added to the value of the book.

The work is of rather convenient size, and is attractively gotten up.

Hay Fever and its Successful Treatment. By W. C. Hallopeter, A. M., M. D. (*Philadelphia: P. Blakiston, Son & Co.*, 1898.)

About two-thirds of this little volume is taken up with the history of hay fever, or, what amounts to the same thing, the discussion of its exciting and predisposing causes. Then come descriptions of the symptoms and theories of its pathology, etc., and about ten pages at the end of the work are devoted to the treatment. The author pins his faith upon a systematic course of daily atomizing, and swabbing the nasal and post-nasal mucosa with antiseptic solutions (Dobell's solution, well diluted, is recommended), with such general tonic measures and attention to the diet, habits, etc., as appear indicated in each individual case. Any existing

abnormal condition of the nasal passages is, of course, to be looked for and remedied if possible. In old cases, when the nerve habit of this disease has become established, he advises this treatment for several weeks before the expected onset of the attack, but does not apparently give the duration of the treatment, and it may be assumed that in some cases, at least, he would continue it through the whole hay fever period. It is to be inferred that by this method also, and indeed he expressly so states in his remarks on prognosis, he succeeds in time in breaking up the tendency and curing the patients in the majority of cases.

The book is clearly written and can be read comfortably at a sitting. A bibliography is appended that seems fairly full as regards recent American contributions.

Diseases of the Eye. A Hand-book of Ophthalmic Practice, for Students and Practitioners. By G. E. DE SCHWEINITZ, A. M., M. D., Professor of Ophthalmology in the Jefferson Medical College; Professor of Diseases of the Eye in the Philadelphia Polyclinic; Ophthalmic Surgeon to the Philadelphia Hospital; Ophthalmologist to the Orthopædic Hospital and Infirmary for Nervous Diseases. With 255 illustrations and two chromo-lithographic plates. Third edition; thoroughly revised. (*Philadelphia: W. B. Saunders*, 925 *Walnut St.*, 1899.)

The fact that the publishers have found it necessary in so short a time to issue another edition of the work of this gifted ophthalmologist is strong evidence that the fruits of his labors are speaking positively and that the "Hand-book" has won its success by supplying, probably more fully than any other American text-book on this subject, the wants of students and practitioners.

The author is to be congratulated upon such a substantial tribute to the value of what he has done for ophthalmology in this country.

The first edition of Dr. de Schweinitz's book was widely and favorably criticised, and it is unnecessary here to review at length a third edition. We note that paragraphs on the following subjects have been added to this edition: Favus of the Eyelids, Blepharo-chalasis, Koch-Weeks' Bacillus Conjunctivitis (Acute contagious Conjunctivitis), Pneumococcus Conjunctivitis, Diplo-bacillus Conjunctivitis (subacute Conjunctivitis), Parinaud's Conjunctivitis, Pneumococcus Infection of the Cornea, Mixed (Staphylococci, Streptococci) Infection of the Cornea, Schizomycetal Infection of the Cornea, Oyster Shucker's Keratitis, Fugacious Periodic Episcleritis, Röentgen Rays for detecting foreign bodies in the Vitreous, Retinitis Striata, Hereditary Optic-nerve Atrophy, Eucain and Holocain. While it is evident that the author is no advocate of the so-called mechanical theory of the origin of pannus (page 249), we think that he might have expressed his own views more positively with reference to this interesting process. The belief is gaining ground that pannus is the corneal manifestation of trachoma,—in other words, that it is an invasion of the cornea by the trachomatous process. The fact that the region of the upper lid is the seat of the intensest manifestations of trachoma is, we think, sufficient reason for the usual location of pannus, not because the granules are more marked in this region, but because the specific bacteria are probably there in greater numbers and purity than anywhere else in the conjunctiva, consequently the upper part of the cornea is peculiarly exposed to infection.

What the author says about the use of eserine in corneal ulcers (page 278) should be remembered, and we are in accord with him in thinking that atropine in such cases is the better drug,—indeed further than this, it has always seemed to us that eserine outside of its use in glaucoma, deserves a very insignificant place in ocular therapeutics, and that so far as its use in corneal ulcers is concerned, the condition of irritation is far more apt to be heightened than ameliorated.

The author quotes Nettleship (page 308) as saying that episcleritis is more common in men than in women. We have found just the reverse, and so also have Meyer and Stellwag. It would be interesting to know what the author's own experience has been in this connection.

It is not uncommon to hear students complaining of the great number of remedies and methods of treatment laid down in the text-books out of which a choice must be made. We think that the most effective and, in many respects, the safest teacher of ophthalmology to whom we have ever listened was one who was in the habit of delivering his opinions as axioms, who used very few drugs, and who rarely spent much time upon the rehearsal of other men's theories and suggestions. There is probably no science so rich in discarded theories and so hampered with worthless suggestions as medicine, and the text-book which banishes such material from its pages will be apt to leave the most lasting impression upon its readers.

The book which Dr. de Schweinitz has given us, we are gratified to see, bears throughout the mark of personal experience and is unusually free—except when essential—of "what others think." The chapters on diseases of the conjunctiva and iris (Chapters VI and IX) which are supremely important for students and practitioners are admirable, and did the limits of a review permit we might multiply examples of valuable observations and advice. We cannot close without calling attention to the accuracy and suggestiveness of the many illustrations (255), and to prophesy for this third edition of Dr. de Schweinitz's book no diminished measure of success. R. L. R.

The Care of the Baby. A Manual for Mothers and Nurses. By J. P. CROZER GRIFFITH, M. D. (*W. B. Saunders, Philadelphia*, 1898.)

Although a manual for mothers and nurses, and not distinctly a work for the use of the practicing physician or one interested in the purely scientific side of the subject, the present volume contains so much excellent material, and is so admirably compiled, that it can be read with great advantage by any one who is interested in the care and proper bringing up of young children.

The book is written for the layman, or, rather for the lay woman, and for that reason the author has made use of a style and mode of writing which can be easily understood by her, and has avoided the many technical words and phrases which are so characteristic of the usual literature on this subject. This popular style, we think, will not only be of advantage to those for whom the book is especially designed, but has made the text such attractive reading that it is difficult to see how any one can take up the book without becoming interested in its contents.

The entire subject of the "Care of the Baby" has been most thoroughly taken up, and the author begins with a consideration of some points of importance to be observed by the mother and nurse during the latter part of pregnancy and labor. This is followed by chapters on the baby's growth, the baby's clothes, feeding the baby, exercise and training, the baby's nurses and rooms, and, finally, the sick baby.

There are so many excellent points throughout the entire volume that, in so short a review, it is almost impossible to give a just criticism. The section on feeding the baby is particularly good, and we are glad to see that the author has taken such a positive stand as to the duty of every mother to nurse her own child; and also that, in the consideration of the subject of artificial feeding, he has followed largely the rules laid down by Rotch, of Boston. Under the sections on exercise and training, and the baby's nurses and rooms the mother will find many valuable hints on the proper hygienic management, care, and moral training of her offspring, the importance of which cannot be possibly overestimated.

The chapter on the sick baby has been treated under the following headings: I. The features of disease. II. The management of sick children, and III. The disorders of childhood. The first of these divisions, that on the features of disease has, we think, the disadvantage of not being complete enough to be of value to the physician and probably too full and technical for the

mother, whose mind may be filled with so many apparent symptoms that she will be made very miserable by the slightest indisposition on the part of her child. It contrasts markedly with the section on the management of sick children, which deserves nothing but the highest commendation. Under the third section, on the disorders of childhood, a brief account is given of all diseases peculiar to that period of life, and especial stress laid on their nursing and management. The work is completed by a good appendix containing accurate directions and receipts for making various articles of diet and medicines and for giving baths, hot and cold packs, spongings, etc.

Dr. Griffith has avoided criticism by making the statement in his preface that "the chapter on the sick baby is not intended to supplant the physician, but is designed especially for mothers in emergency, where medical aid cannot be quickly obtained"; and in emphasizing the importance of this statement we feel that we are not doing wrong in recommending the book most highly to mothers, nurses, and physicians.

A Text-Book of Obstetrics. By BARTON COOKE HIRST, M. D., Professor of Obstetrics in the University of Pennsylvania. (*Philadelphia: W. B. Saunders*, 925 *Walnut St.*, 1898.)

Professor Hirst is so very well known both as a practical obstetrician and a teacher of obstetrics that the title of this volume alone should be more than enough to assure its getting into the hands of the majority of specialists, general practitioners, and students of obstetrics throughout the country. The work is an admirable one in every sense of the word, concisely but comprehensively written, in a style which makes its reading more a matter of entertainment than the perusal of numerous dry facts and dogmatic statements, which is unfortunately so characteristic of many other books on this same subject. Frequent reference in the text has been made to the work of others, both in this country and abroad; but a laudable effort evidently has been made to avoid mentioning the long lists of names and the tedious recapitulation of literary productions, which, in the opinion of the author, only tend to confuse and to complicate matters for the student. Hence, only the epoch-making articles have been referred to.

The illustrations of the book are, for the most part, excellent, and although some of them cannot be said to come strictly into the category of art, yet they have the advantage of bringing out the points which the author wants them to show. Exceptions to this might be made, however, in the case of a few reproduced photomicrographs, which occur in the section on the placenta. Photomicrographs may be scientifically accurate from the purely optical standpoint, but it is so very rare that one sees the reproduction of one of these pictures showing what is claimed for it, that it is with considerable regret that we see them, however few, in a publication possessing so many other advantages.

The author has divided his subject into the following sections: Pregnancy, Physiology and Management of Labor, and the Puerperium, the Mechanism of Labor, the Pathology of Labor, Pathology of the Puerperium, Obstetric Operations and the New-born Child.

The section on pregnancy is, in the main, excellent, and offers no points for criticism, except that possibly enough stress has not been put upon the development of the fœtal appendages; we do not mean by this that there should be anything like a full treatise on human embryology in this place; but the development of the placenta with its relation to the decidua and uterine wall is so important a subject that we think a little more space might have been allotted to it. The diseases of the fœtal appendages, placenta, membranes, decidua, etc., are considered immediately after the question of their development. This is a new departure, for these subjects are, in the majority of text-books, given a section to themselves, and put later in the volume. Their consideration, however, at this time and place may have distinct advantages, for, clinically, many of these conditions cannot be recognized until after labor, and when put under a separate heading, as is usually done, the student may get the idea that they are desperate diseases to be treated *per se*.

Too much credit cannot be given to the masterly manner in which the author has presented the subjects of the management of normal labor and the puerperal state, but it is difficult to see why these subjects should have been taken up before the mechanism of labor has been considered.

The treatise on pelvic contraction and deformity, and labor when complicated by such conditions, is an excellent one in every possible sense of the word. This section appeared a few years ago in the first edition of the American Text-Book of Obstetrics, and to those who are familiar with this work it needs no recommendation.

We are somewhat surprised that the author has not mentioned the importance of a bacteriological diagnosis, by means of the uterine culture, in puerperal infection, nor can we agree with him in thinking that in many cases the repeated, frequent douching of an infected uterus to be of value, for in our experience such cases are by no means the rule. He also advises the routine use of the curette; and strong (1-2000) bichloride intra-uterine douches; upon this point we must also confess that we are skeptical. In our opinion the treatment of puerperal infection and the determination as to whether we shall use the curette and douche are directly dependent upon the nature of the infection as indicated by the bacteriological findings in the uterine lochia. Except the above, the section on puerperal infection is good.

Operative obstetrics and the section on the care of the new-born child are both well worked up, though that on the new-born child is short and more might have been said on the subject of infant feeding.

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